ALL INDIA TECHNICIAN EXAMINATION

ELECTRICIAN TRADE

VOLUME-II

(English Medium)

Previous Year Chapterwise Solved Papers

Useful for: ■ UPPCL TG-2 ■ UPRVUNL TG-2 ■ RRB LOCO PILOT ■ RRB TECHNICIAN ■ ISRO ■ NPCIL ■ BIHAR TECHNICIAN ■ KPSC LINEMAN ■ KPSC INSTRUCTOR ■ WBPSC ELECTRICIAN ■ CPRI ■ NVS ■ KVS ■ PUNJAB ELCTRICIAN INSTRUCTOR ■ JVVNL ELECTRICIAN HELPER-III ■ HSSC ■ GAIL ■ GSSSB TECHNICIAN INSTRUCTOR ■ ORDNANCE FACTORY ■ METRO MAINTAINER ■ DMRC/LMRC/NMRC/BMRC/JMRC ■ HAL ELECTRICIAN ■ NPCIL ■ TSSPDCL ■ ISRO TECHNICIAN ■ HAL ■ THDC ■ CRPF CONSTABLE ■ INDIAN ARMY ■ UPSSSC ■ TUBEWELL OPERATOR ■ CRPF TRADESMAN ■ UKSSSC ELECTRICIAN INSTURCTOR

Chief Editor
A. K. Mahajan
Written & Complied by
Er. Santosh Kumar Yadav
Computer Graphics By
Balkrishna Tripathi & Charan Singh
Editorial Office
12, Church Lane Prayagraj-211002
Mob. : 9415650134
Email : yctap12@gmail.com
website : www.yctbooks.com / www.yctfastbook.com / www.yctbooksprime.com

Publisher Declaration
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INDEX

Note : Occupational Safety and Health, Tools for An Electrician, Basic Electricity, Conductor, Semiconductor, Insulator and Electrical Material, Soldering, Electrical Accessories, Electro-chemical Effect and Cell- Battery, Magnetism and Electromagnetism, Alternating Current Theory, Earthing, Electrical Instruments & Measurement, Utilization, Domestic Electrical Appliances, Electrical Power Generation, Electrical Power Transmission, Electrical Power Distribution, Underground Cables. **(Study Volume-I)**

RRB ALP Techenician (Electrician) Syllabus
ELECTRICIAN

■ **Occupational Safety & Health–** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard. ■ **Soft Skills**– its importance and Job area after completion of training.Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure. Identification of Trade-Hand tools-Specifications. Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units & effects of electric current. Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code 2011 Explanation, Definition and properties of conductors, insulators and semi-conductors. Voltage grading of different types of Insulators, Temp. Rise permissible Types of wires & cables standard wire gauge Specification of wires & Cables-insulation & voltage grades -Low , medium & high voltage Precautions in using various types of cables / Ferrules ■ **Ohm's Law -** Simple electrical circuits and problems. Reading of simple Electrical Layout. ■ **Resistors -**Law of Resistance. Series and parallel circuits. ■ **Kirchoff's** Laws and applications. Wheatstone bridge principle And its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB. ■ **Chemical effect of electric current-**Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electro-plating and Electro chemical equivalents. Explanation of Anodes and cathodes. Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Ni-cadmium & Lithium cell, Cathodic protection. Electroplating, Anodising. Different types of lead acid cells. Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage & current, Sealed Maintenance free Batteries, Solar battery. Inverter, Battery Charger, UPS-Principle of working. Lead Acid cell, general defects & remedies. Nickel Alkali Cell-description charging. Power & capacity of cells. Efficiency of cells. ■ **ALLIED TRADES–** Introduction of fitting trade. Safety precautions to be observed Description of files, hammers, chisels hacksaw frames & blades-their specification & grades. Care & maintenance of steel rule try square and files. Marking tools description & use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing & holding tools-their care and maintenance. ■ **Types of drills description & drilling machines–** proper use, care and maintenance. Description of taps & dies, types in rivets & riveted joints. Use of thread gauge. Description of marking & cutting tools such as snubs shears punches & other tools like hammers, mallets etc. used by sheet metal workers. Types of soldering irons-their proper uses. Use of different bench tools used by sheet metal worker. Soldering materials, fluxes and process. ■ **Magnetism -** Classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses. ■ **Alternating Current -**Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f). Active and Reactive power, Simple problems on A.C. circuits, single Phase and three-phase system etc. Problems on A.C. circuits. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. ■ **Earthing-** Principle of different methods of earthing. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines. ■**Basic electronics-** Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter.

■ **Working principle and uses of an oscilloscope–** Explanation of principle of working of a transistor & configuration. Types of transistors & its application. Specification and rating of transistors. Explanation of transistor Amplifiers, Amplifiers. – class A,B and C Power amplifier ■ **Explanation of oscillator–**working principle Explanation of stages and types. Multivibrator – applications. Introduction of basic concept of ICs, U.J.T., F.E.T. Basic concept of power electronics devices e.g. S.C.R., Diac, Triac, power MOSFET, G.T.O and I.G.B.T. ■ **Digital Electronics** -Binary numbers, logic gates and combinational circuits, ■ **Electric wirings–** I.E. rules. Types of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of laying out in domestic wiring. Voltage drop concept. ■ **Wiring system–** P.V.C., concealed system. Maintenance and Repairing data sheet preparation. Specifications, standards for conduits and accessories - Power Wiring - Control Wiring - Information Communication - Entertainment Wiring. Testing of wiring installation by meggar. Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc. ■ **D.C. Machines–** General concept of Electrical Machines. ■ **Principle of D.C. generator–** Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring Brushes, Laminated core. Explanation of **D.C. Generators**-types, parts. **E.M.F**. equation-self excitation and separately excited Generators-Practical uses. Brief description of series, shunt and compound generators. Explanation of Armature reaction, inter poles and their uses, connection of inter poles, Commutation. Losses & Efficiency of D.C.Generator, Parallel Operation of D.C.Generator. Application of D.C. generators. Care, Routine & preventive maintenance. ■ **DC Motors**– Termsused in D.C. motor-Torque, Brake Torque, speed, Back-e.m.f. etc. and their

relations, Types of D.C.Motor. Starters used in D.C. motors Related problems Characteristics of D.C.Motor, Losses & Efficiency, Application of D.C. motors. Care, Routine & preventive maintenance. Types of speed control of DC motors in industry. Control system. AC-DC, DC-DC control. ■ **Working principle of Transformer–** classification C.T., P.T. Instrument and Auto Transformer(Variac), Construction, Single phase and Poly phase. E.M.F. equation, parallel operation of transformer, their connections. Regulation and efficiency. Type of Cooling for transformer. Protective devices. Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency. Special transformers. Transformer –Classification of transformer. Components, Auxiliary parts i.e. breather, Conservator, buchholze relay, other protective devices. Transformer oil testing and Tap changer (off load and on load). Dry type transformer. Bushings and termination. ■ **Electrical Measuring Instruments–** -types, indicating types. Deflecting torque, Controlling torque and Damping torque , PMMC & MI meter (Ammeter, Voltmeter) -Range extension - Multimeter(Digital/Analog) -Wattmeter - P.F. meter - Energy meter (Digital/analog) –Insulation Tester (Megger), Earth tester. -Frequency meter -Phase Sequence meter -Multimeter – Analog and Digital -Tong tester -Techometer.

■ **Three phase Induction motor –**Working principle – Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Construction , characteristics and Speed control, Slip & Torque . Control & Power circuit of starters D.O.L Starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc Single phasing preventer. Losses & efficiency. Application of Induction Motor Care, Routine & preventive maintenance. ■ **Single phase induction motor-** Working principle, different method of starting and running (capacitor start, permanent capacitor, capacitor start & run, shaded pole technique). FHP motors, Repulsion motor, stepper motor, Hysteresis motor, Reluctance motor. Application of Single phase induction motor ■ **Universal motor**-advantages, Principle, characteristics, applications in domestic and industrial appliances, Fault Location and Rectification. Braking system of motor. Application of Universal motor. ■ **Alternator–**Explanation of alternator, types of prime mover, efficiency, regulations, phase sequence, Parallel operation. Specification of alternators and Brushless alternator. Verify the effect of changing the field excitation and Power factor correction of Industrial load. ■ **SYNCHRONOUS MOTOR–** Working principle, effect of change of excitation and load. V and anti V curve. Cause of low power factor. Method of power factor improvement. Rotary Converter- Inverter, M.G. Set description, Characteristics, specifications- running and Maintenance. Solid state controller and Invertors. ■ **TRANSFORMER Winding–** Small Transformer winding techniques ■ **DC machine Winding--** Armature winding terms, pole pitch, coil pitch, back pitch, front pitch , Lap and Wave winding , Progressive and retrogressive Winding, developed diagram. Growler construction, working & application. ■ **ACmachine Winding—**Motor winding terminology– classification of conducting and insulating materials used in winding – Types and methods of winding in single and three phase motors. Stator winding terms, coil side, end coil and grouping of coils. Connection to adjacent poles, connected stator winding, alternate pole connection, developed diagram.

■ **Illumination–** Laws of Illuminations, terminology used , Illumination factors, intensity of light –importance of light, human eye factor, , units. Types of illumination Type of lamps -Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp & photo cell applications, Decoration lighting, Drum Switches, efficiency in lumens per watt, Calculations of lumens. Estimating placement of lights, fans and ratings. ■ **Industrial wiring**– Code of practice and relevant span. Wiring of electric motors, control panel, etc. Types, specifications, advantages of different types of circuit brackets construction and maintenance. Working principle and construction of domestic and agricultural appliances-their maintenance. ■ **Complete House–** wiring layout. Splitting load wire in accordance with NEC I.E.E. Rules. Multi-storeyed system. Fault finding and trouble shooting.

■ **Machine control cabinet /Control Panel Layout, Assembly & Wiring**:– Layout of Control cabinet & control panel Study & Understand Layout drawing of control cabinet , panel, power & control circuits. ■ **Control Elements:–** Isolator, pushbutton switches, Indicating lamps, MCB, Fuse, Contactor, Relays, Overload Relay, Timers, Rectifier, Limit switches, control transformers. Wiring Accessories: Race ways/ cable channel, DIN Rail, Terminal Connectors, Thimbles, Lugs, Ferrules, cable binding strap & buttons, nylon cable ties, sleeves, Gromats& clips ■ **Domestic Appliances:–** Working principles and circuits of common domestic equipment and appliances. – Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light. Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc. Concept of Neutral and Earth.

■ **POWER GENERATION :–** Generation sources of energy, Comparison of energy resources. Types of fuels. Advantages of liquid fuel & solid fuel. Various ways of electrical power generation. • Thermal • Hydro electric • Nuclear • Non-Conventional Thermal Coal based, diesel based & Gas based Turbine. Constituents in steam power station. ■ **Hydro Electric:–** Schematic arrangement of Hydro-Electric Power Station. Constituents of Hydro Electric Plant. Types of Hydro Electric Power station. Advantages &disadvantages.

■ **Nuclear:–** Schematic arrangement of Nuclear Power Station. Composition of an atomic Nucleus. Advantages & disadvantages. Comparison of above Power Plant. ■ **Non-Conventional–** An introduction to Power generation through non-conventional power generation such as Solar, Bio-Gas, Wind energy and Micro-hydel, Tidal waves, etc. Basic principal, Advantages & disadvantages of each.

■ **TRANSMISSION OF ELECTRICAL POWER–** Electrical Supply System : Comparison of AC and DC transmission. Advantages of High transmission voltage. Introduction to Single phase , three phase-3 wire system in transmission lines Overhead Lines: Main components of overhead lines-Types of power line Low voltage line medium Voltage line & high voltage line Voltage standard Conductor materials, line supports, Insulators, types of Insulators

■ **Under Ground Cable :** Construction of cables. Material for cables, its insulation. Classification of cables, cables for 3-phase service, Laying of underground cable. Types of cable faults and their location. ■ **DISTRIBUTION OF POWER–** Function and equipment used in substation. Classification of distribution system-AC distribution, Overhead v/s underground distribution system. Essential features of switchgears. Isolator, Switch gear equipments, bus-bar arrangement, Short circuit, faults in power system. ■ **Circuit breakers**– Introduction & Classification of circuit breakers lightening arrestors used in HT lines. Introduction, Construction & Working of power transistor, thyristor. Introduction, Construction, Working, Parameters & application of DC drive. Speed control of 3 phase induction motor by using VVVF/AC Drive. Introduction, Construction, Working, Parameters & application of AC drive Schedule of electrical preventive maintenance. Break down, Routine & Preventive maintenance of DC/AC machines, Voltage stabilizer, U.P.S. &Equipments.

UPPCL/UPRVUNL Technician Grade-2 Exam Syllabus

UPPCL TECHNICAL SUBJECTS SYLLABUS

Technical Subject (Electrician) :

1. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard.
2. Identification of Trade-Hand tools-Specifications.
3. Fundamental of electricity. Electron theory-free electron. Fundamental terms, definitions, units and effects of electric current.
4. Solders, flux and soldering technique. Resistors types of resistors and properties of resistors.
5. Explanation, Definition and properties of conductors, insulators and semi-conductors. Voltage grading of different types of Insulators, Temp. Rise permissible. Types of wires and cables standard wire gauge Specification of wires and Cables-insulation and voltage grades-Low, medium and high voltage Precautions in using various types of cable.
6. Ohm's Law-Simple electrical circuits and problems.
7. Resistors-Law of Resistance. Series and parallel circuits.
8. Kirchhoff's Laws and applications. Wheatstone bridge principle and its applications.
9. Common Electrical Accessories, their specifications-Explanation of switches lamp holders, plugs and sockets. Developments of domestic ckts, Alarm and switches, lamp, fan with individual switches, Two way switch.
10. Chemical effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electro-plating and Electro chemical equivalents. Explanation of Anodes and cathodes. Lead acid cell-description, methods of charging-precautions to be taken and testing equipment, Ni-cadmium and Lithium cell, Cathodic protection. Electroplating, Anodising.

UPRVUNL TECHNICAL SUBJECT SYLLABUS

Technical Subject (Electrician) :

1. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard.
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Analysis Chart of Previous Year Electrician TG-2 and Other Technician Exams.

S.L.	EXAM NAME	EXAM DATE/TIME	No. OF QUESTIONS
Uttar Pradesh Power Corporation Limited (UPPCL)			
1.	UPPCL TG-2	03.11.2023 Shift-I	1×150
2.	UPPCL TG-2	03.11.2023 Shift-II	1×150
3.	UPPCL TG-2	07.11.2023 Shift-I	1×150
4.	UPPCL TG-2	07.11.2023 Shift-II	1×150
5.	UPPCL TG-2	08.11.2023 Shift-I	1×150
6.	UPPCL TG-2	08.11.2023 Shift-II	1×150
7.	UPPCL TG-2	09.11.2023 Shift-I	1×150
8.	UPPCL TG-2	09.11.2023 Shift-II	1×150
9.	UPPCL TG-2	10.11.2023 Shift-I	1×150
10.	UPPCL TG-2	10.11.2023 Shift-II	1×150
11.	UPPCL TG-2	17.11.2023 Shift-I	1×150
12.	UPPCL TG-2	17.11.2023 Shift-II	1×150
13.	UPPCL TG-2	19.03.2021 Shift-I	1×150
14.	UPPCL TG-2	19.03.2021 Shift-II	1×150
15.	UPPCL TG-2	20.03.2021 Shift-I	1×150
16.	UPPCL TG-2	20.03.2021 Shift-II	1×150
17.	UPPCL TG-2	27.03.2021 Shift-I	1×150
18.	UPPCL TG-2	27.03.2021 Shift-II	1×150
19.	UPPCL TG-2	28.03.2021 Shift-I	1×150
20.	UPPCL TG-2	28.03.2021 Shift-II	1×150
21.	UPPCL TG-2	24.01.2019 Shift-I	1×150
22.	UPPCL TG-2	24.01.2019 Shift-II	1×150
23.	UPPCL TG-2	25.01.2019 Shift-I	1×150
24.	UPPCL TG-2	25.01.2019 Shift-II	1×150
25.	UPPCL TG-2	16.10.2016	1×100
26.	UPPCL TG-2	11.11.2016	1×100
27.	UPPCL TG-2	26.06.2016	1×100
28.	UPPCL TG-2	02.08.2015	1×150
29.	UPPCL TG-2	09.05.2015	1×150
30.	UPPCL TG-2	08.11.2014	1×150
Uttar Pradesh Rajya Vidhyut Utpadan Nigam Limited (UPRVUNL)			
31.	UPRVUNL TG-2	22.12.2022 (Shift – II)	1×150
32.	UPRVUNL TG-2	21.12.2022 (Shift – I)	1×150
33.	UPRVUNL TG-2	21.12.2022 (Shift – II)	1×150
34.	UPRVUNL TG-2	14.07.2021 Shift-I	1×150
35.	UPRVUNL TG-2	14.07.2021 Shift-II	1×150
36.	UPRVUNL TG-2	15.07.2021 Shift-I	1×150
37.	UPRVUNL TG-2	15.07.2021 Shift-II	1×150
38.	UPRVUNL TG-2	17.07.2021 Shift-I	1×150
39.	UPRVUNL TG-2	09.11.2016	1×150
40.	UPRVUNL (Electrical)	22.09.2015	1×150
41.	UPRVUNL TG-2	22.09.2015	1×150
Bihar State Power Holding Company Limited (BSPHCL)			
42.	BIHAR TG-2	03.11.2018 (Batch-1)	1 × 50
43.	BIHAR TG-2	03.11.2018 (Batch-2)	1 × 50
44.	BIHAR TG-2	03.11.2018 (Batch-3)	1 × 50
45.	BIHAR TG-2	03.11.2018 (Batch-4)	1 × 50
46.	BIHAR TG-2	04.11.2018 (Batch-1)	1 × 50
47.	BIHAR TG-2	04.11.2018 (Batch-2)	1 × 50
48.	BIHAR TG-2	04.11.2018 (Batch-3)	1 × 50
49.	BIHAR TG-2	27.11.2018 (Batch-1)	1 × 50
50.	BIHAR TG-2	27.11.2018 (Batch-2)	1 × 50
51.	BIHAR TG-2	28.11.2018 (Batch-2)	1 × 50

ISRO (Technician-B)			
52.	ISRO (SDSC) (Technician-B)	04.06.2022 (4.30–6.30)	1×80
53.	ISRO (URSC) (Technician-B)	03.11.2022 (12.0–1.30)	1×60
54.	ISRO (VSSC) (Technician-B)	14.07.2021 (4:30-6:30)	1×80
55.	ISRO (VSSC) (Technician-B)	02.06.2019	1×80
56.	ISRO (VSSC) (Technician-B)	10.02.2019	1×50
57.	ISRO (Technician-B)	02.06.2019	1×80
58.	ISRO (Technician-B)	24.03.2019	1×60
59.	ISRO (SDSC) (Technician-B)	10.02.2019	1×80
60.	ISRO (SDSC) (Technician-B)	29.04.2018 (2:30-4:0)	1×50
61.	ISRO (SAC Ahmedabad) (Technician-B)	01.07.2018	1×100
62.	ISRO (SAC Ahmedabad) (Technician-B)	18.11.2018	1×90
63.	ISRO (Technician-B) Ahmedabad	29.04.2018	1×90
64.	ISRO (Technician-B) Sriharikota	29.04.2018	1×50
65.	ISRO (VSSC) (Technician-B)	10.12.2017	1×80
66.	ISRO Satelite Centre Bengluru	2016	1×60
67.	ISRO Electronic Mechanic Technician-B	2016	1×60
68.	ISRO Electroplating Technician-B	2016	1×60
69.	ISRO (URSC) (Technician-B)	27.11.2016 (9:30–11:00)	1×60
70.	ISRO (VSSC) (Technician-B)	25.09.2016	1×80
71.	ISRO (VSSC) (Technician-B)	06.11.2016	1×80
72.	ISRO (SAC Ahmedabad) (Technician-B)	06.11.2016	1×100
73	ISRO (VSSC) (Technician-B)	21.02.2015	1×60
Delhi (DSSSB)			
74.	DSSSB Electric Driver Motor Man	11.07.2023	1×100
75.	DSSSB Craft instructor	18.08.2019	1×100
76.	DSSSB Instructor Electrician	06.10.2019	1×100
77.	DSSSB Craft instructor wireman	01.09.2014	1×100
78.	DSSSB Craft instructor	10.02.2014	1×100
Delhi Metro Rail Corporation (Maintainer)			
79.	DMRC Maintainer (Electrician)	17.02.2020 (9.00 to 10.30)	1×75
80.	DMRC Maintainer (Electrician)	18.02.2020 (9.00 to 10.30)	1×75
81.	DMRC Maintainer (Electrician)	19.02.2020 (9.00 to 10.30)	1×75
82.	DMRC Maintainer (Electrician)	20.02.2020 (9.00 to 10.30)	1×75
83.	DMRC Maintainer (Electrician)	09.04.2018 (9.00 to 10.30)	1×75
84.	DMRC Maintainer (Electrician)	10.04.2018 (9.00 to 10.30)	1×75
85.	DMRC Maintainer (Electrician)	11.04.2018 (9.00 to 10.30)	1×75
86.	DMRC Maintainer (Electrician)	13.04.2018 (9.00 to 10.30)	1×75
87.	DMRC Maintainer (Electrician)	17.04.2018 (9.00 to 10.30)	1×75
88	DMRC Maintainer (Electrician)	18.04.2018 (9.00 to 10.30)	1×75
89.	DMRC Maintainer (Electrician)	15.02.2017	1×75
90.	DMRC Maintainer (Electrician)	21.02.2017	1×75
91.	DMRC Maintainer (Electrician)	13.07.2014	1×75
92.	DMRC Maintainer (Electrician)	13.04.2014	1×75
93.	DMRC Maintainer (Electronic)	20.07.2014	1×75
UP/Lucknow Metro Rail Corporation (Maintainer)			
94.	UPMRC (Electrician)	28.09.2021	1×75
95.	LMRC Maintainer (Electrical)	16.03.2018	1×75
96.	LMRC Maintainer (Electrical)	12.05.2018 (Shift-2)	1×75
97.	LMRC Maintainer (Electrical)	16.03.2016	1×75
98.	LMRC Maintainer (Electronic)	16.03.2016	1×75

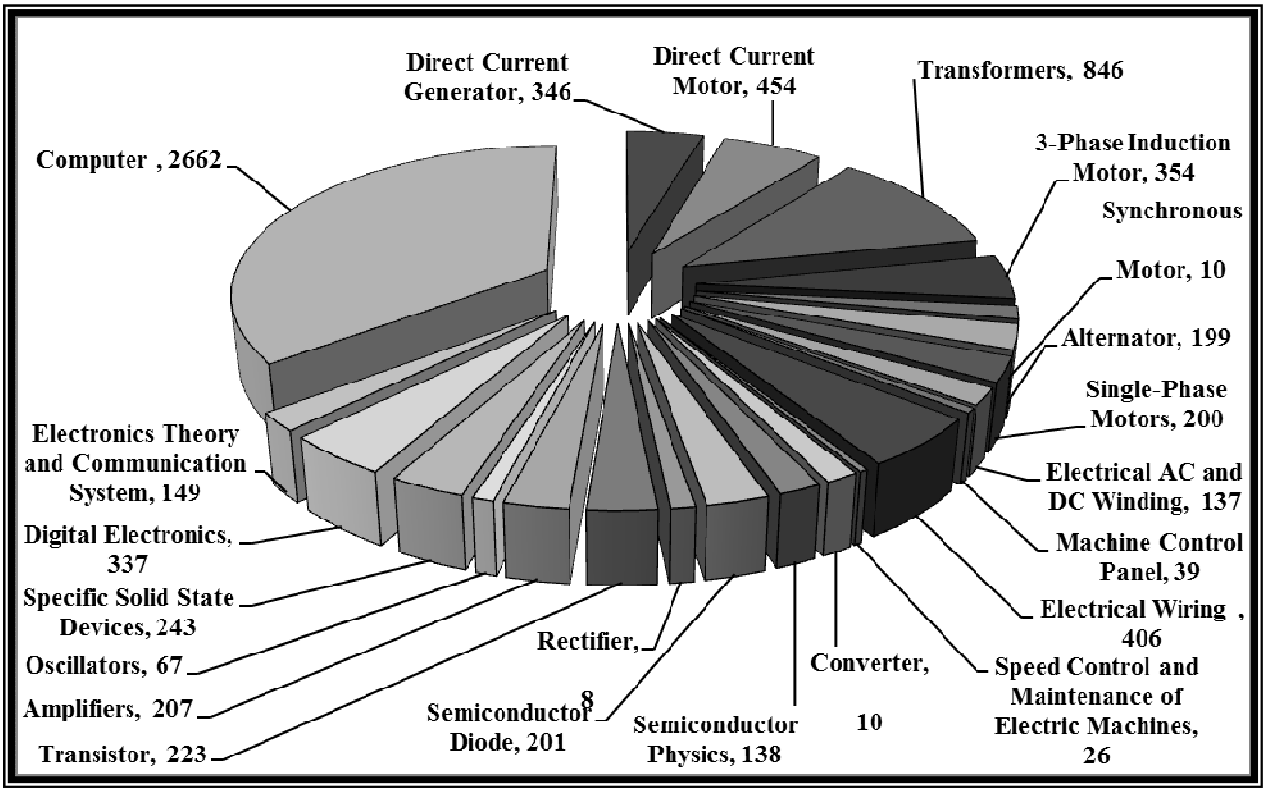
Noida, Jaipur & Bangalore Metro Rail Corporation (NMRC/JMRC/BMRC)			
99.	JMRC Maintainer (Electrician)	12.09.2022	1×45
100.	JMRC Maintainer (Electrician)	11.06.2021	1×55
101.	Noida Metro Maintainer (Electrician)	14.09.2019	1×45
102.	Noida Metro Maintainer (Electrician)	07.03.2017 (8.30 to 10.45)	1×75
103.	Noida Metro Maintainer (Electrician)	07.03.2017 (12.00 PM)	1×75
104.	Noida Metro Maintainer (Electrician)	2017	1×75
105.	Jaipur Metro Maintainer (Electrician)	2016	1×45
106.	Bangalore Matro Maintainer (Electrician)	2016	1×47
Kerala PSC			
107.	KPSC Electrician	07.05.2022	1×100
108.	KPSC Lineman	19.01.2021	1×100
109.	KPSC Lineman	19.02.2021	1×100
110.	KPSC Electrician	30.09.2020	1×100
111.	KPSC Lineman Instructor Electrician	16.09.2020	1×100
112.	KPSC Junior Instructor	19.08.2019	1×80
113.	KPSC Junior Instructor	19.08.2019	1×80
114.	KPSC Lineman	07.02.2018	1×80
115.	KPSC Electrician Instructor	16.01.2017	1×80
116.	KPSC Wireman Instructor	26.02.2016	1×80
117.	KPSC Lineman	21.04.2016	1×100
118.	KPSC Instructor wireman	30.08.2016	1×80
119.	KPSC Lineman	05.05.2016	1×80
120.	KPSC Electrician Instructor	22.07.2015	1×80
121.	KPSC Electrician	2015	1×80
122.	KPSC Lineman	10.12.2015	1×100
123.	KPSC Instructor Electronics	25.06.2014	1×80
124.	KPSC Instructor Electronics	15.09.2014	1×80
125.	KPSC Junior Instructor	09.07.2014	1×80
126.	KPSC Junior Instructor electronic mechanics	04.10.2010	1×80
Rajasthan (JVVNL) Electrician Helper III			
127.	JVVNL Electrician Helper III	02.11.2022	1×100
128.	JVVNL Electrician Helper III	27.08.2022	1×100
129.	JVVNL Electrician Helper III	23.08.2018 (8:30)	1×100
130.	JVVNL Electrician Helper III	23.08.2018 (12:00)	1×100
131.	JVVNL Electrician Helper III	23.08.2018 (3:30)	1×100
132.	JVVNL Electrician Helper III	24.08.2018 (8:30)	1×100
133.	JVVNL Electrician Helper III	24.08.2018 (12:00)	1×100
134.	JVVNL Electrician Helper III	24.08.2018 (3:30)	1×100
135.	JVVNL Electrician Helper III	25.08.2018 (8:30)	1×100
136.	JVVNL Electrician Helper III	25.08.2018 (12:00)	1×100
137.	JVVNL Electrician Helper III	25.08.2018 (3:30)	1×100
138.	JVVNL Electrician Helper III	27.08.2018 (8:30)	1×100
139.	JVVNL Electrician Helper III	27.08.2018 (12:00)	1×100
140.	JVVNL Electrician Helper III	27.08.2018 (3:30)	1×100
141.	JVVNL Electrician Helper III	29.08.2018 (8:30)	1×100
142.	JVVNL Electrician Helper III	29.08.2018 (12:00)	1×100
143.	JVVNL Electrician Helper III	29.08.2018 (3:30)	1×100
Rajasthan			
144.	RSMSSB Instructor (Electrician)	24.03.2019	100
145.	RSMSSB Instructor (Wireman)	24.03.2019	100

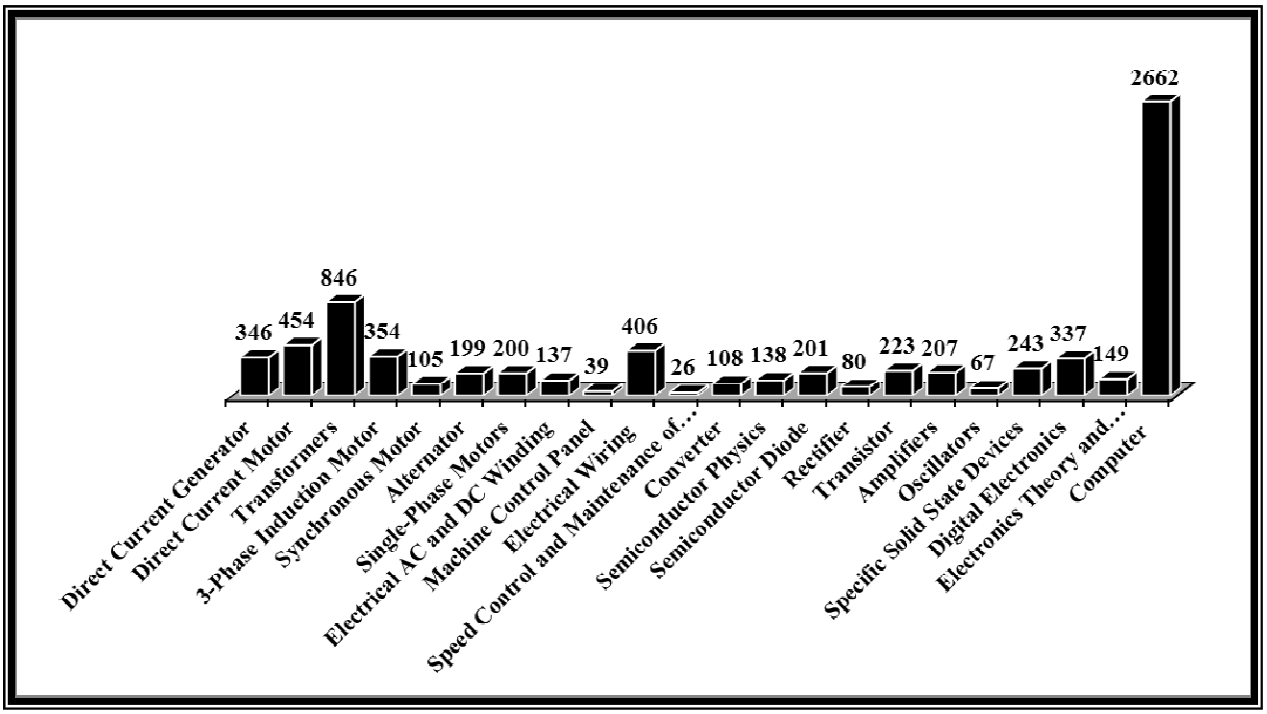
Madhya Pradesh			
146.	MPESB Electrician	22.12.2022	1×75
147.	MPESB Electrician	21.12.2022 (Morning)	1×75
148.	MPESB Electrician	21.12.2022 (Evening)	1×75
149.	MP Line Attendant	24.12.2018	1×75
150.	MP Line Attendant	24.08.2018	1×75
151.	MP Line Attendant	24.07.2018	1×75
152.	MP Line Attendant	23.07.2018	1×75
153.	MP Line Attendant	26.07.2017	1×75
154.	MP Line Attendant	26.08.2017	1×75
155.	MP Electrician instructor	07.11.2016 (Morning)	1×50
156.	MP Electrician Instructor	07.11.2016 (Evening)	1×50
Gujarat			
157.	GSSSB Technical Instructor	01.01.2022	1×150
158.	GSSSB Supervisor Instructor	15.09.2019	1×150
159.	GSSSB Electronics instructor	22.01.2017	1×150
160.	GSSSB Instructor electrical	15.01.2016	1×150
161.	GSSSB Instructor electrician	27.03.2016	1×150
162.	GSSSB Instructor grade B	30.12.2016	1×150
Maharashtra			
163	MAHA TRANSCO Electrician	2023	1×80
Jharkhand			
164	JSSC Technician	20.10.2023	1×120
165	JSSC Technician	19.09.2023	1×120
Uttarakhand			
166.	UKSSSC Electrician instructor	16.09.2021	1×100
167.	UKSSSC Electrician instructor	16.06.2019	1×100
168.	UKSSSC Tech. Electrical instructor	21.11.2017	1×100
Punjab			
169.	Chandigarh Assistant Lineman	09.04.2023	1×100
170.	Punjab Electrical instructor	07.07.2013	1×60
171.	Punjab Wireman instructor	07.07.2013	1×60
Himachal Pradesh			
172.	HPSSC Hamirpur electrician instructor	13.10.2019	1×120
173.	HP SSC Wireman Instructor	15.07.2018	1×120
Haryana			
174.	HSSC (ALM) Shift-I	14.03.2020	1×40
175.	HSSC (ALM) Shift-II	14.03.2020	1×40
176.	HSSC (ALM) Shift-III	14.03.2020	1×40
177.	HSSC electrician instructor	12.12.2019	1×40
178.	HSSC Electronics Mechanic instructor	17.12.2019	1×40
179.	Haryana Shifting Assistant Shift-I	2016	1×32
180.	Haryana Shifting Assistant Shift-II	2016	1×32
Arunachal Pradesh			
181.	APSSB Instructor electrician	18.09.2021	1×50
182.	ITI supervisor Instructor electrical	27.03.2011	1×150
183.	Electrical instructor	13.04.2005	1×70
Telangana			
184.	TSSPDCL junior lineman Telangana	2022	1×80
185.	TS TRANSCO junior lineman Telangana	10.07.2020	1×70

West Bengal			
186.	WBSETCL Electrician	2023	1×120
187.	WBPSC Electrician Instructor	23.05.2021	1×150
188.	WBPSC Electrician Instructor	18.09.2021	1×150
NVS			
189.	NVS Electrician cum plumber	08.03.2022 (12:30-3:00)	1×60
190.	NVS Electrician cum plumber	08.03.2022 (12:30-3:00)	1×60
GAIL			
191.	GAIL – Technician (Telecom & Telemetry)	21.11.2022	1×50
192	GAIL – Technician (Telecom & Telemetry)	19.12.2022	1×40
Ordnance Factory			
193.	Ordnance factory ITI Technician	17.01.2022	1×50
194.	Ordnance Factory	2017	1×80
CPRI			
195.	CPRI Technician Trade I	31.07.2023 (12:00-1:30 PM)	1×40
196.	CPRI-ITI-Electrician	09.12.2022 (1:00- 2:30 PM)	1×40
197.	CPRI-ITI-Electrician	09.12.2022(9:00-10:30 AM)	1×40
198.	CPRI Technician Trade	05.02.2021	1×55
RAILWAY RECRUITMENT BOARD ALP/Technician			
199.	Assistant Loco pilot (ALP)	21.01.2019 (12.30 to 3.00)	1×75
200.	Assistant Loco pilot (ALP)	22.01.2019 (8.30 to 11.00)	1×75
201.	Assistant Loco pilot (ALP)	22.01.2019 (4.30 to 7.00)	1×75
202.	Assistant Loco pilot (ALP)	23.01.2019 (8.30 to 11.00)	1×75
203.	Assistant Loco pilot (ALP)	23.01.2019 (12.30 to 3.00)	1×75
204.	Assistant Loco pilot (ALP)	23.01.2019 (4.30 to 7.00)	1×75
205.	R.R.B. Mumbai Asst. Loco Pilot	03.06.2001	1×13
206.	R.R.B. Gorakhpur Asst. Loco Pilot	21.10.2001	1×14
207.	R.R.B. Secunderabad Asst. Loco Pilot	11.11.2001	1×12
208.	R.R.B. Patna Asst. Loco Pilot	11.11.2001	1×13
209.	R.R.B. Gorakhpur Asst. Loco Pilot	14.04.2002	1×12
210.	R.R.B. Kolkata Asst. Loco Pilot	29.09.2002	1×12
211.	R.R.B. Chennai/Bangalore Asst. Loco Pilot	27.10.2002	1×14
212.	R.R.B. Mumbai/Bhopal Asst. Loco Pilot	05.01.2003	1×13
213.	R.R.B. Ranchi Asst. Loco Pilot	19.01.2003	1×13
214	R.R.B. Chandigarh Asst. Loco Pilot	25.05.2003	1×14
215.	R.R.B. Ranchi Asst. Loco Pilot	21.09.2003	1×12
216.	R.R.B. Gorakhpur Asst. Loco Pilot	12.10.2003	1×11
217.	R.R.B. Bangalore Asst. Loco Pilot	25.01.2004	1×13
218.	R.R.B. Ajmer Asst. Loco Pilot	23.05.2004	1×10
219.	R.R.B. Trivandrum Asst. Loco Pilot	20.06.2004	1×14
220.	R.R.B. Ajmer Asst. Loco Pilot	10.10.204	1×14
221.	R.R.B. Ahmadabad Asst. Loco Pilot	17.10.2004	1×13
222.	R.R.B. Kolkata Asst. Loco Pilot	06.02.2005	1×13
223.	R.R.B. Mumbai Asst. Loco Pilot	05.06.2005	1×12
224.	R.R.B. Ajmer Asst. Loco Pilot	05.06.2005	1×12
225.	R.R.B. Ranchi Asst. Loco Pilot	04.09.2005	1×14
226.	R.R.B. Guwahati Asst. Loco Pilot	22.01.2006	1×14
227.	R.R.B. Kolkata Asst. Loco Pilot	16.07.2006	1×14

228.	R.R.B. Mumbai Asst. Loco Pilot	16.07.2006	1×13
229.	R.R.B. Malda Asst. Loco Pilot	16.07.2006	1×13
230.	R.R.B. Gorakhpur Asst. Loco Pilot	08.10.2006	1×11
231.	R.R.B. Patna Asst. Loco Pilot	04.02.2007	1×11
232.	R.R.B. Bangalore Asst. Loco Pilot	08.07.2007	1×12
233.	R.R.B. Ranchi Asst. Loco Pilot	08.07.2007	1×14
234.	R.R.B. Allahabad Asst. Loco Pilot	09.12.2007	1×12
235.	R.R.B. Secunderabad Asst. Loco Pilot	29.06.2008	1×14
236.	R.R.B. Allahabad Asst. Loco Pilot	03.08.2008	1×12
237.	R.R.B. Chandigarh Asst. Loco Pilot	14.09.2008	1×12
238.	R.R.B. Kolkata Asst. Loco Pilot	02.11.2008	1×11
239.	R.R.B. Muzaffarpur Asst. Loco Pilot	15.02.2009	1×11
240.	R.R.B. Bhubneswar Asst. Loco Pilot	14.06.2009	1×11
241.	R.R.B. Mumbai Asst. Loco Pilot	14.06.2009	1×11
242.	R.R.B. Gorakhpur Asst. Loco Pilot	11.10.2009	1×11
243.	R.R.B. Bhopal Asst. Loco Pilot	06.06.2010	1×12
244.	R.R.B. Chennai Asst. Loco Pilot	06.06.2010	1×12
245.	R.R.B. Jammu-Kashmir Asst. Loco Pilot	06.06.2010	1×14
246.	R.R.B. Secunderabad Asst. Loco Pilot	06.06.2010	1×12
247.	R.R.B. Mumbai Asst. Loco Pilot	15.07.2012	1×13
248.	R.R.B. Chandigarh Asst. Loco Pilot	15.07.2012	1×14
249.	R.R.B. Bangalore Asst. Loco Pilot	15.07.2012	1×13
250.	R.R.B. Bhubaneswar Asst. Loco Pilot	15.07.2012	1×12
251.	R.R.B. Bilaspur Asst. Loco Pilot	15.07.2012	1×11
252.	R.R.B. Ahmedabad Asst. Loco Pilot	2014	1×100
253.	R.R.B. Ranchi Asst. Loco Pilot	2014	1×100
254.	R.R.B. Kolkata Asst. Loco Pilot	2014	1×100
255.	R.R.B. Siliguri Asst. Loco Pilot	2014	1×100
256.	R.R.B. Patna Asst. Loco Pilot	2014	1×100
Other State & PSU's Examinations			
257.	ONGC Trade Electrician	20.08.2022	1×80
258.	NFL Non Executive examination	17.01.2022	1×80
259.	NPCIL ITI Maintainer	04.09.2022	1×50
260.	NCL Electrician	18.12.2021	1×100
261.	IREL Tradesman	17.04.2021	1×50
262.	NPCIL (STM)	03.12.2019	1×50
263.	PGCIL	14.11.2018	1×120
264.	IOCL Technical Attendant	11.02.2018	1×65
265.	CRPF Constable Tradesman	2016	1×45
266.	CRPF Overseer	2016	1×38
267.	HAL Electrician	2015	1×36
268.	MES Electrician Tradesman	2015	1×39
269.	VIZAAG Steel Electrician	2015	1×34
270.	ESIC Electrician	2015	1×55
271.	THDC Electrician	2015	1×45
272.	MAZGAON DOCK Ltd.	2013	1×38
Total			**20879**

Trend Analysis of Electrician Questions Through Pie Chart and Bar Graph





01. Direct Current Generator

1. The main purpose of commutator in DC generator is?

(a) To convert AC to DC
(b) To reduce copper losses
(c) To invert DC to AC
(d) To reduce Iron losses

UPPCL TG-2, 17.11.2023, Shift-II
JSSC Electrician-19.09.2023
ONGC Electrician-20.08.2022
UPPCL TG-2, 28.03.2021 Shift I
ISRO (VSSC) – Technician B, 14.07.2021
UPPCL TG-2, 25.01.2019 Shift I
ISRO (VSSC) – Technician B, 24.01.2019
ISRO DT-24.03.2019
UPPCL TG-2, 2015

Ans : (a) The main purpose of commutator in D.C generator is to convert AC to DC .

- The material used in commutator is hard drawn copper.
- Split ring are also known as a commutator.
- For D.C generator commutator is known as a mechanical rectifier or rotating rectifier.
- For DC motor commutator is known as mechanical inverter or rotating inverter.
- In D.C machine, number of commutator segment are equal to the number of armature coils.

2. How are the interpole field coils of a D.C generator are connected?

(a) In parallel with the armature winding
(b) In series with the armature winding
(c) In parallel with the field winding
(d) In series with the field winding

UPPCL TG-2, 09.11.2023, Shift-II
UPPCL TG-2, 28.03.2021 Shift I
ALP Technician- 23.01.2019, 8:30-11:00
ISRO (VSSC) Technician (B)- 14.07.2021, 4:30-6:30
MP Line Attendant- 27.07.2018
Keral PSC Wireman Instructor-26.02.2016

Ans : (b) The interpole field coils of a D.C generator are connected in series with the armature winding. Hence the same current will flow in the interpole winding but in opposite direction.

- Interpole is a small pole.
- No. of inter pole is equal to the main pole.
- By this method demagnetization and cross-magnetization effect can be eliminated hence it improve commutation in the interpole region.
- And sparking will reduces at commutator surface.

3. DC generators works on the principle of _____.

(a) Faraday's law of electromagnetic induction
(b) Kirchhoff's law
(c) Lenz's law
(d) Ampere's law

UPPCL TG-2, 09.11.2023, Shift-I
UPPCL TG-2 (24-01-2019) Shift-I
UPPCL TG-2 (24-01-2019) Shift-II
MP Line Attendant (23-07-2018)
Technical Helper (27-08-2018) Shift-I
ISRO Ahmedabad (29-04-2018)

Ans : (a) DC generator works on the principle of faraday's law of electromagnetic induction.

- It is used to convert mechanical energy to electrical energy.
- According to faraday's law of electromagnetic induction we know that when a current carrying conductor is placed in a varying magnetic field an emf is induced in the conductor.

4. If the variable loss of a D.C generator is equal to the fixed loss, then which of the following statements regarding its efficiency is correct?

(a) Maximum efficiency
(b) Full load efficiency
(c) Half of maximum efficiency
(d) Twice of maximum efficiency

MAHATRANSCO Electrician-2023
UPPCL TG-2, 28.03.2021 Shift II
UPPCL TG-2 Electrical, 2015
UPPCL TG-2, 24.01.2019 Shift I
GSSB Instructor Grade B- 30.12.2016
RSMSSB Instructor Electrician- 24.03.2019

Ans (a) : The variable loss of a D.C generator is equal to the fixed loss, then the maximum efficiency

$$\text{variable loss} = \text{fixed loss}$$

- Armature copper loss in DC machine are about 30% of the total full load losses.
- Field winding copper loss in DC machine are about 25% theoretically, but practically it is constant.
- Brush losses in DC machine are usually assumed to be about 2 volt.
- Mechanical losses in DC machine are usually very small about 15% of full load loss.

5. Which of the following is known as the outer frame in DC machines?

(a) Yoke (b) Armature core
(c) Commutator (d) Brushes
(e) Shaft

UPPCL TG-2, 09.11.2023, Shift-I
JVVNL Technical Helper-27.08.2022, 12:00-2:00PM
UPPCL TG-2, 24.01.2019 Shift-II
UPRVVNL TG-2, 15.07.2021 Shift-I
LMRC Maintainer Electrician Exam-2016
UPRVVNL TG-2, 21.12.2022 Shift-II

Ans. (a) : Outer frame in D.C machine is called yoke.

- Yoke act as the protective covering
- It supports the main field pole as well as interpole.
- It provides flux path completion $\left(\frac{\phi}{2}\right)$ therefore yoke should be good magnetic material.
- In small D.C machine it is made by cast iron but in case of large size machine it is made by cast steel and rolled steel.

6. The material used in split rings is-

(a) Gold (b) Copper
(c) Iron (d) Aluminium
(e) Plastic

UPPCL TG-2, 10.11.2023, Shift-I
JVVNL Technical Helper-27.08.2022,12:00-2:00PM
UPPCL TG-2, 25.01.2019 Shift-II
UPPCL TG-2, 28.03.2021 Shift-II

Ans. (b) : The material used in split rings is copper.

- Split ring are also known as commutators.
- Split-ring or commutator is a rotating part of D.C machine.
- In D.C machine, Number of commutator segment are equal to the number of armature coils.
- The main function of commutator in a D.C machine is to change AC voltage into DC voltage and vice-versa.
- For D.C generator commutator is known as a mechanical rectifier or rotating rectifier
- For D.C motor commutator is known as mechanical inverter or rotating inverter.

7. Rotational losses in electrical machines consist of _____.

(a) Friction and windage losses
(b) Stator core, friction and windage losses
(c) Rotor core, friction and windage losses
(d) Stray load losses and friction and windage losses

UPPCL TG-2, 10.11.2023, Shift-I
IOCL Technical Attendent-12.09.2022
JVVNL Electrician Helper –III, 24.08.2018 Shift-II
JVVNL Electrician Helper-III, 24.08.2018 Shift-I

Ans. (a) : Rotational losses in electrical machines consist of friction and windage losses.

- Friction and windage losses are the mechanical losses.

Losses in a rotating D.C machine:-

(i) Copper losses or variable losses :-

- Armature copper loss
- Field copper loss
- Losses due to brush contact resistance

(ii) Iron losses or constant losses:-

- Hysteresis loss
- Eddy current loss

(iii) Stray losses = Iron loss + mechanical loss

8. What is the electrics machine that converts mechanical energy into electrical energy is called?

(a) Electric circuit breaker
(b) Electric motor
(c) Electric wattmeter
(d) Electric generator

UPPCL TG-2, 09.11.2023, Shift-I
UPRVUNL TG-2, 14.07.2021 Shift II
UPCL TG-2, 15.07.2021 Shift-II
HSSC ALM- 14.03.2020 Shift-III
HPSSC Lineman Instructor-15.07.2018

Ans. (d) : The electric machine that converts mechanical energy into electrical energy is called electric generator.
Electric motor device that convert electrical energy into mechanical energy.

9. If the series field turns are so adjusted that, the full load terminal voltage is equal to the no-load terminal voltage, the generator is known as ..... generator.

(a) Un-compounded (b) Over compounded
(c) Under compounded (d) Level compounded

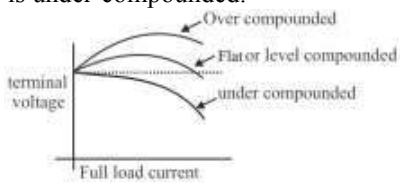
UPPCL TG-2, 17.11.2023, Shift-I
UPPCL TG-2, 07.11.2023, Shift-II
UPRVUNL (TG-2) 21.12.2022, Shift-II
DSSSB Craft Instructor Wireman-01.09.2019

Ans. (d) : If the series field turns are so adjusted that, the full load terminal voltage is equal to the no-load terminal voltage, the generator is know as level compounded generator.

- Level compounded generator is used in short distances such as in noted and office buildings because the loss of voltage over a small lengths of feeder is negligible.

Over compounded generator –
If the series field ampere-turns are such that the rated-load voltage is greater than the no-load voltage, the generator is over compounded generator.

Under compounded generator –
If the series field ampere-turn are such that the rated-load voltage is less than the no-load voltage then the generator is under-compounded.



10. In a DC generator, the generated EMF is inversely proportional to .....

(a) The magnetic flux per pole
(b) The speed of armature
(c) The number of parallel paths
(d) The number of poles

UPPCL TG-2, 08.11.2023, Shift-I
UPPCL TG-2, 09.11.2023, Shift-I
UPRVUNL (TG-2) 21.12.2022, Shift-II
IREL Electrician Trades man- 04.09.2022
DSSSB Craft Instructor Wireman- 01.09.2019

Ans. (c) : In a DC generator, the generated E.M.F is inversely proportional to number of parallel paths.

$$E_g = \frac{N P \phi Z}{60A}$$

Where,

E_g = Generated emf
N = Speed in r.p.m
P = number of pole
ϕ = Flux in per pole
Z = number of armature conductor
A = Number of parallel path

$$E_g \propto \frac{1}{A}$$

E.M.F is directly proportional to speed, number of pole, flux-and number of conductor.

11. Which of the following is defined as the stray loss in a DC generator?

(a) Power loss in lateral circuit
(b) Mechanical loss + core loss
(c) Frictional loss of breaking + frictional loss in commutator + Air friction loss
(d) Hysteresis loss + eddy current loss

UPPCL TG-2, 07.11.2023, Shift-II
UPPCL TG-2, 08.11.2023, Shift-II
UPPCL TG-2, 28.03.2021 Shift II
UPPCL TG-2, 25.01.2019 Shift I

Ans (b) : Mechanical loss + core loss is known as stray loss in DC generator.
■ There are same uncountable losses in a D.C machine that are difficult to measure are called stray losses.

$$\text{Stray loss} = \text{mechanical loss} + \text{core loss}$$

12. The generator may loss its residual magnetism due to-
(a) Its being kept idle of along time
(b) A heavy short circuit
(c) Heavy overloading
(d) Its being subjected to much heat
(e) All of the options

UPPCL TG-2, 08.11.2023, Shift-II
JVVNL Technical Helper-27.08.2022,12:00-2:00PM
RRB Chandigarh (LP)- 2012

Ans. (e) : A generator may lose residual magnetism due to heating, vibration and over excitation.

13. Which of the following is NOT a condition for parallel operation of DC generator?
(a) Same percentage voltage regulation
(b) Same voltage rating
(c) Same operating temperature
(d) Same percentage speed regulation of prime movers

UPPCL TG-2, 08.11.2023, Shift-II
UPPCL TG-2, 19.03.2021 Shift I
UPPCL TG-2, 27.03.2021 Shift-II

Ans : (c) Same operating temperature is not a condition for parallel operation of DC generator.
Condition for parallel operation of DC generator :-
■ Same percentage voltage regulation
■ Same voltage rating
■ Same percentage speed regulation of prime movers.

14. A dc generator used for arc welding should have
(a) raising characteristics
(b) perpendicular characteristics
(c) straight characteristics
(d) drooping characteristics

UPPCL TG-2, 07.11.2023, Shift-I
UPPCL TG-2, 08.11.2023, Shift-II
UPPCL TG-2, 08.11.2023, Shift-I
(UPPCL-TG2-Electrical-2015)

Ans : (d) A DC generator used for arc welding should have dropping characteristic.
■ A differential compound DC generator used for arc welding.

Type of Generator	Application
Shunt Generator	Battery charging
Series Generator	Used as booster
Cumulative compound Generator	For lamp load and for heavy power service such as electric railway.

15. For a DC generator, external characteristic shows relation between
(a) Terminal voltage and load current
(b) Terminal voltage and speed
(c) Generated voltage and filed current
(d) Generated voltage and armature current

UPPCL TG-2, 17.11.2023, Shift-II
UPRVUNL (TG-2) 21.12.2022, Shift-II
KPSP Electrician Water Transport- 25.02.2016

Ans. (a) : For a DC generator, external characteristic shows relation between terminal voltage and load current.
External characteristic (V/I_L) – This curve show the relation between the terminal voltage (V) and load current (I_L).
Internal characteristics (E_g/I_a) –
This curve shows the relation between the generated e.m.f on load (E_g) and armature current (I_a).
Open circuit characteristic (O.C.C) –
This curve shows the relation between the generated e.m.f at No-load (E_o) and the field current (I_F) at constant speed.

16. Which one of the part of DC generator is used to spread out the flux in the air gap uniformly?
(a) Pole shoes (b) Pole core
(c) Armature core (d) Commutator

UPPCL TG-2, 17.11.2023, Shift-II
UPPCL TG-2, 09.11.2023, Shift-II
ISRO (VSSC) Technician (B) 25.09.2016

Ans. (a) : Pole shoes of dc generator is used to spread out the flux in the air gap uniformly.
■ Pole shoes is attached to pole core by means of counter shunk screw. Pole shoe is made by to cast iron or cast steel. Pole shoe is laminated in order to reduce eddy current loss.
■ Pole shoe provide mechanical support to the field winding.
■ It distributes the magnetic field uniformly through air gap.
■ It provide low reluctance path for field flux

17. An ideal DC generator is one that has _____ voltage regulation.
(a) Maximum (b) Negative
(c) Zero (d) Positive

UPPCL TG-2, 09.11.2023, Shift-I
(CRPF Constable Tradesman Uttar Pradesh Electrician-06.01.2013)

Ans : (c) An ideal DC generator is one that has zero voltage regulation.

$$\text{Voltage regulation} = \frac{\text{No load voltage} - \text{full load voltage}}{\text{Full load voltage}}$$

■ Shunt generator is positive voltage regulation.
■ Series generator is negative voltage regulation.
Order of voltage regulation in descending order-
Series > differential > over compound > shunt > separately compound > Flat compound.

18. Which of the following collects current from the commutator?
(a) Bearings
(b) Bearing plate
(c) Carbon brush
(d) Terminal plate

UPPCL TG-2, 07.11.2023, Shift-II
UPPCL TG-2, 17.11.2023, Shift-II
UPPCL Technical Grade-II Electrical 11.11.2016

Ans : (c) Carbon brush is collecting current from the commutator in a DC generator.
■ Brush is a stationary part of DC machine. Which is collect the current from commutator in DC generator.
■ In DC motor, brushes are use to provide DC current to commutator from DC supply.
■ Carbon brushes are used for low capacity machine.

■ Graphite brushes are preferred for high voltage and low current machine.
■ Copper brushes are preferred for low voltage and high current rotating machine .

19. In lap winding the number of parallel paths are
(a) A = 2 (b) A = P
(c) A = 4 (d) A = 1

UPPCL TG-2, 17.11.2023, Shift-II
(UPPCL-TG2-Electrical-2015)

Ans : (b) In lap winding, the number of parallel paths are equal to the number of poles.

$$A = P$$

■ In wave winding the number of parallel paths are equal to two.

$$A = 2$$

Simplex Lap winding	Simplex wave winding
1. The back and front pitches are odd and of opposite sign. But they cannot be equal.	1. Both pitches Y_B and Y_F are odd and of the same sign.
2. Both Y_B and Y_F should be nearly equal to a pole pitch.	2. Resultant pitch $Y_R = Y_F + Y_B$
3. Commutator pitch $Y_C = \pm 1$	3.Commutator pitch, $Y_C = Y_A$ (in lap winding $Y_C = \pm 1$

20. Electrical efficiency of a DC generator is given by .....

(a) $\eta_e = \frac{E_g I_a}{VI}$ (b) $\eta_e = \frac{V}{E_g}$

(c) $\eta_e = \frac{E_g}{V}$ (d) $\eta_e = \frac{VI}{E_g I_a}$

UPPCL TG-2, 17.11.2023, Shift-II
UPRVUNL TG-2, 17.07.2021 Shift I

Ans (d) : Electrical efficiency of a DC generator is -

$$\eta_e = \frac{VI}{E_g I_a}$$

Mechanical efficiency of a DC generator is -

$$\eta_m = \frac{E_g I_a}{\text{Output of engine}}$$

Where:-
V = Terminal voltage
I = Load current
E_g = Induced emf.

21. In DC generators, the brushes on commutator remain in contact with conductors which–
(a) lie under south pole
(b) lie under north pole
(c) lie under interpolar region
(d) are farthest from the poles

UPPCL TG-2, 03.11.2023, Shift-I
KPSC Electrician– 07.05.2022

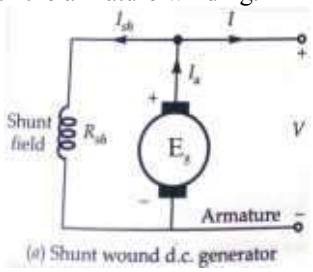
Ans. (c) : In DC generator, the brushes on commutator remain in contact with conductors which lie under inter-polar region.
■ Brushes are made of carbon.
■ Width of Carbon brushes should be equal to the width of 2 to 3 commutator segments.

■ Copper brushes are preferred for low voltage and high current rotating machine.
■ Graphite brushes are preferred for high voltage and low current rotating machine.

22. Which type of DC generator is called constant voltage generator?
(a) DC series generator
(b) DC shunt Generator
(c) DC long shunt compound generator
(d) DC short shunt compound generator

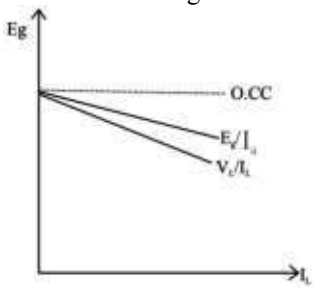
UPPCL TG-2, 17.11.2023, Shift-II
MPESB Electrician-22.12.2022
CPRI ITI Electrician-19.12.2022
ISRO (SAC) Ahmedabad Technician (B) 18.11.2018

Ans. (b) : DC shunt generator is called constant voltage generator.
■ In DC shunt generator, field winding is connected in parallel with the armature winding.



$I_a = I_{sh} + I_L$
$V = E_g - I_a R_a$

■ Characteristic of DC Shunt generator is



23. What will be the approximate value of armature winding resistance for 5kW DC machine?
(a) 0.15 ohm (b) 15ohm
(c) 100ohm (d) 1kilo ohm

UPPCL TG-2, 10.11.2023, Shift-I
MPPKVVCL Line Attendant 26.09.2017

Ans : (a) The value of armature winding resistance is 0.15 ohm for 5 kW DC machine.
■ In DC machine, the resistance of the field or shunt winding is 100Ω

24. Which of the following statements is incorrect for cell and DC generator?
(a) No relative losses in cell and frictional, windage losses in generator
(b) The efficiency of DC generator is more than cell
(c) Cell is stationary device and generator is rotational device
(d) Cell changes chemical energy to electrical and generator changes mechanical energy into electrical

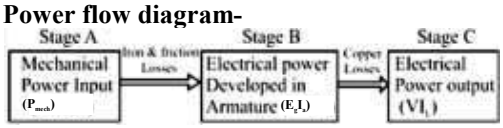
UPPCL TG-2, 10.11.2023, Shift-I

Ans. (b) : The efficiency of DC Generator is more than cell this statement is incorrect for cell and DC Generator.

■ The efficiency of a DC Generator is defined as the ratio of mechanical input power to the output electrical power.

$$\text{Efficiency } (\eta) = \frac{\text{Electrical power output } (P_o)}{\text{Mechanical Power Input } (P_i)}$$

Power flow diagram-



Iron and friction losses = Stage (A) – Stage (B)

Copper losses = Stage (B) – Stage (C)

■ The ampere-hour efficiency of a lead-acid cell is about 90%.

■ The watt-hour efficiency of a lead acid cell varies between 70% to 80%.

25. Which of the following is correct statement for simplex lap winding in a DC generator?

(a) Each parallel path has Z/2 conductors in series, Z being total number of armature conductor

(b) Emf generated = parallel path/EMF

(c) Total armature current = Number of poles × current per parallel path

(d) In lap winding only 2 parallel paths

UPPCL TG-2, 10.11.2023, Shift-I

Ans. (c) : Total armature current = Number of poles x current per parallel path.

That is correct statement for simplex lap winding in a DC Generator.

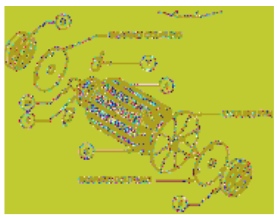
■ In lap winding, the number of parallel path (A) is the same as the number of brushes and poles.

■ Lap winding is mainly used for low voltage and high current application.

■ The lap winding is also called parallel winding because the coils are connected in parallel whereas in the wave winding the coils are connected in series hence it is called series winding.

■ The EMF of the lap winding is less as compared to wave winding.

26.



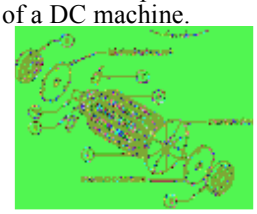
What is the name of the part indicated by number 7 in given diagram of a DC machine?

(a) Armature core (b) Field coil

(c) Ball bearing (d) Carbon brush

UPPCL TG-2, 08.11.2023, Shift-II

Ans. (d) : The name of the part indicated by number 7 is carbon brush of a DC machine.



In the part of DC machine given above figure-

4→ Armature core

5→ Armature winding or armature conductor

6→ Commutator.

7→ Carbon brush

8→ Bearing end plate

10→ Shaft

27. A four-pole generator with a wave-wound armature has 1020 conductors. What will be the voltage generated in the machine when driven at the speed of 1500 rpm, assuming the flux per pole to be 7.0 mWb?

(a) 245 V (b) 357 V

(c) 423 V (d) 389 V

UPPCL TG-2, 09.11.2023, Shift-II

Ans. (b) : Given that,

Number of pole (P) = 4

Number of Armature conductor (Z) = 1020

Speed (N) = 1500 rpm

Flux per pole (ϕ) = 7.0 mWb

Number of parallel path (A) = 2 (wave winding)

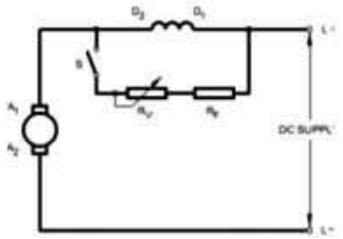
Formula,

$$E_g = \frac{NP\phi Z}{60A}$$

$$E_g = \frac{1500 \times 4 \times 7 \times 10^{-3} \times 1020}{60 \times 2}$$

$$\boxed{E_g = 357\,V}$$

28.



Identify the speed control method that is shown in the above circuit.

(a) Field tapping method

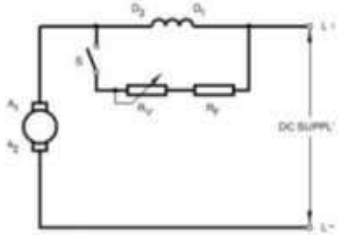
(b) Armature diverter method

(c) Field diverter method

(d) Armature control method

UPPCL TG-2, 09.11.2023, Shift-II

Ans. (c) : Field diverter method is shown in the circuit.



Field diverter method-

■ Field diverter circuit is used for speed control of DC series motor.

■ In this method, a low value resistance (diverter) is connected across the field.

■ In this method, the speed can be controlled only above base speed.

29. Full load armature current of a 200 V, dc series motor is 50 A. What mechanical power it develops if the total resistance of armature circuit is 0.1Ω?

(a) 8750 W (b) 8500 W
(c) 10 kW (d) 9750 W

UPPCL TG-2, 17.11.2023, Shift-II

Ans. (d) : Given that,

Voltage (V) = 200 V
Armature current (I_a) = 50 A
Armature Resistance (R_a) = 0.1Ω
Mechanical power (P_m) = ?

$P_m = VI_a - I_a^2R_a$
$P_m = 200\times50 - 50^2\times0.1$
$P_m = 10{,}000 - 2500 \times 0.1$
$P_m = 10{,}000 - 250$
$\boxed{P_m = 9750\,W}$

30. The motor generator set can be used for conversion for electrical power from AC to DC by using _____.

(a) induction motor and induction generator.
(b) induction motor and DC generator.
(c) DC motor and DC generator.
(d) DC motor and induction generator.

UPPCL TG-2, 17.11.2023, Shift-II

Ans. (b) : The motor generator set can be used for conversion for electrical power from AC to DC by using induction motor and DC generator.

Motor-Generator set-

■ Motor generator set is a device used to convert electrical power to another form of energy (Mostly AC to DC).

■ It consists of a motor and a generator connected mechanically on the same shaft.

■ A motor set is a convert consisting of a three phase AC motor and a DC generator (generally compound DC generator) which is used to convert the AC supply to the DC supply and vice versa.

31. In an 8-pole DC generator, how many cycles of EMF are generated in one completed rotation of the armature?

(a) 16 (b) 4 (c) 2 (d) 8

UPPCL TG-2, 17.11.2023, Shift-II

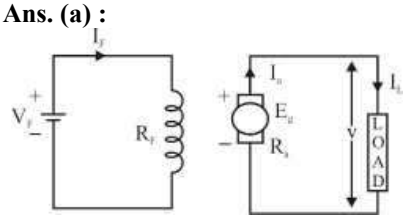
Ans. (b) : In an 8-pole DC generator, 4 cycles of emf are generated in one completed rotation of the armature. Hence, one cycle is generated for a two pole generator. So for an 8 pole generator 4 cycles are generated.

32. A separately excited DC generator givens load voltage of 200V, while taking a line current of 20A. What is the generated voltage if the armature resistance is 0.5 Ω?

(a) 210 V (b) 220 V
(c) 200 V (d) 190 V

UPPCL TG-2, 17.11.2023, Shift-II

Ans. (a) :



Given that,

Voltage (V) = 200 V
Armature current (I_a) = (I_L) = 20 A
Armature resistance (R_a) = 0.5Ω
Generated voltage (E_g) = ?

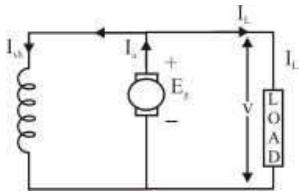
Formula, $E_g = V + I_aR_a$
$E_g = 200+20\times0.5$
$\boxed{E_g = 210V}$

33. A DC shunt generator delivers an armature current of 22 A on full load full load with a terminal voltage of 200 V. If the field current is 2 A, What is the load power?

(a) 400 W (b) 4 kW
(c) 4.4 kW (d) 2 kW

UPPCL TG-2, 17.11.2023, Shift-II

Ans. (b) :



Given that,

Armature current (I_a) = 22 Amp
Terminal voltage (V) = 200 V
Field current (I_f) = 2 Amp
Load power (P) = ?
$I_L = I_a - I_{sh}$
$I_L = 22 - 2$
$\boxed{I_L = 20\ Amp}$
Load power (P) = VI_L
$P = 200 \times 20$
$P = 4000$
$\boxed{P = 4\ kW}$

34. Which of the following materials is used for the field coils of a DC generator?

(a) Nichrome (b) Carbon
(c) Copper (d) Silica

UPPCL TG-2, 09.11.2023, Shift-I

Ans. (c) : Field coil of DC generator is usually made up of copper because it has good electrical conductivity, good thermal conductivity and corrosion resistance.

■ Field coil are former wound and placed on each pole and are connected in series.

■ Yoke is made up of cast iron steel.

■ **Pole shoes serve two purpose-**

(i) They support field coil
(ii) Spread out the flux in air gap uniformly

■ Armature core is made of silicon steel laminations which are insulated from each other by insulating varnish coating.

35. The armature MMF in a DC machine is ..... with respect to field poles and ..... with reference to armature.

(a) zero, infinite (b) infinite, zero
(c) stationary, rotating (d) rotating, stationary

UPPCL TG-2, 09.11.2023, Shift-I

Ans. (c) : The armature MMF in a DC machine is stationary with respect to field pole and rotating with reference to armature.

Armature Reaction- The effect of armature flux on main field flux is called armature reaction.

The armature reaction mmf produces two undesirable effect on the main field flux and these are-

(i) Net reduction in the main field flux per pole

(ii) Distortion of the main field flux wave along the air gap periphery.

36. A 4-pole generator with a simplex wave wound armature has 45 slots, with each slot containing 20 conductors. What will be the voltage generated in the machine when driven at the speed of 1300 RPM, assuming the flux per pole to be 6 mWb?

(a) 234 V (b) 216 V

(c) 312 V (d) 276 V

UPPCL TG-2, 07.11.2023, Shift-I

Ans. (a) : Given,

Pole (P) = 4

Total number of conductor (Z) = 45 × 20

Z = 900

Flux per pole (ϕ pole) = 6 mWb

$= 6\times10^{-3}$ Wb

Number of parallel path (A) = 2 (wave winding)

Generated power (E_g) = ?

Formula,

$$E_g = \frac{P\phi ZN}{60A}$$

$$E_g = \frac{1300\times4\times6\times10^{-3}\times900}{60\times2}$$

$E_g = 13\times2\times9$

$\boxed{E_g = 234 \text{ volt}}$

37. If an armature of a DC machine has a resistance of 0.9 Ω, then its resistance value comes under which of the following categories?

(a) Very high resistance (b) Medium resistance

(c) High resistance (d) Low resistance

UPPCL TG-II, 17.11.2023, Shift- 1

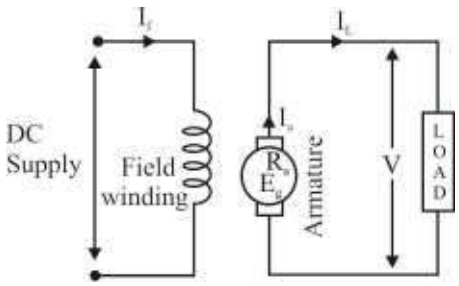
Ans. (d) : If the armature of a DC machine has a resistance of 0.9 Ω, then its resistance value comes under low resistance categories.

Armature winding-

■ The armature winding of the DC motor is attached to the rotor or the rotating part of the machine, and as a result, is subjected to altering the magnetic field in the path of its rotation which directly result in magnetic losses.

■ The armature core is provided with slots made of a same material as the core to which the armature winding is made with several turns of copper wire distributed uniformly over the entire periphery of the core.

38.



Identify the DC machine shown in the given figure.

(a) Separately excited DC motor

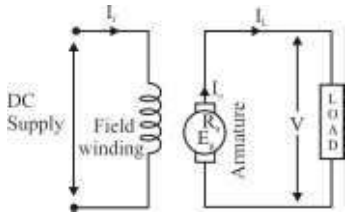
(b) Separately excited DC generator

(c) DC shunt motor

(d) DC shunt generator

UPPCL TG-II, 17.11.2023, Shift- 1

Ans. (b) : Given diagram is separately excited DC generator.



■ Separately excited generator used for electroplating.

■ A separately excited generator is one in which the magnetic field is excited from an external DC source.

39. Number of field windings in a DC compound generator is equal to .....

(a) one (b) four

(c) two (d) three

UPPCL TG-II, 17.11.2023, Shift- 1

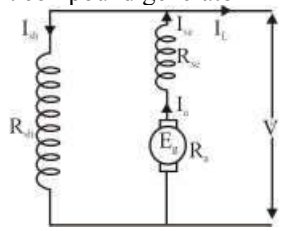
Ans. (c) : Number of field winding in a DC compound generator is equal to two. First one is series field winding and another is shunt field winding.

■ Shunt field winding is more number of turns with thin wire and its resistance is high.

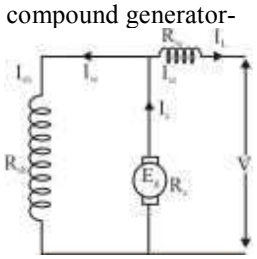
■ Series field winding is less number of turns with thick wire and its resistance is low.

DC compound generator are mainly two types-

1. Long shunt compound generator-



2. Short shunt compound generator-



Application of compound generator- Elevator motors, Railways circuits, heavy power supply incandescent lamps etc.

40. A 250 V DC generator supplies 8 kW at a terminal voltage of 230 V. The armature resistance is 0.6 ohm. The value of armature current is:

(a) 34.78 A (b) 3.478 A

(c) 0.3478 A (d) 347.8 A

UPPCL TG-2, 03.11.2023, Shift-I

Ans. (a) : Given that,

Induced voltage (E_g) = 250 V
Terminal voltage (V) = 230 V
Armature Resistance (R_a) = 0.6 Ω

Formula,

$\boxed{E = V + I_a R_a}$

$250 = 230 + I_a \times 0.6$

$I_a \times 0.6 = 20$

$I_a = \frac{20}{0.6}$

$I_a = 33.33$ Amp

41. In a DC machine the value of voltage drop in brush commutator contact is:

(a) 0 V (b) 3-4 V
(c) 1-2 V (d) 5-6 V

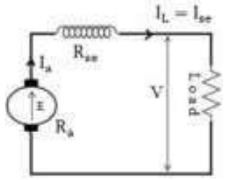
UPPCL TG-2, 03.11.2023, Shift-I

Ans. (c) : In a DC machine the value of voltage drop in brush commutator contact is 1-2 volts.

■ Mainly carbon material is preferred for the Brush because its contact resistance is high and friction is low.

■ Brush is soft carbon material so, it is able to resist arc and speak can be limited.

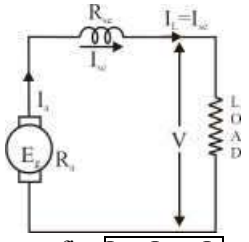
42. The following diagram is of a:



(a) DC series generator
(b) DC shunt generator
(c) DC series motor
(d) DC shunt motor

UPPCL TG-2, 03.11.2023, Shift-I

Ans. (a) : A DC generator, which field winding is connected in series with armature winding is called DC series generator.



According to fig- $\boxed{I_a = I_{se} = I_L}$

■ The field winding of DC series generator is made with thick wire and less number of turns.

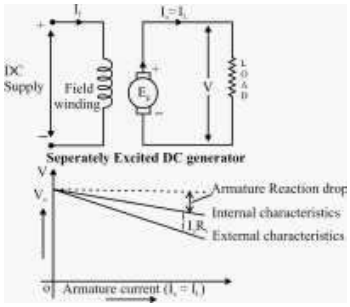
■ Resistance of field winding of DC series generator is low.

43. The characteristic of a separately excited DC generator is plotted between:

(a) load terminal voltage vs. field terminal voltage
(b) load terminal voltage vs. armature voltage
(c) load terminal voltage vs. field current
(d) load terminal voltage vs. armature current

UPPCL TG-2, 03.11.2023, Shift-I

Ans. (d) : The characteristics of a separately excited DC generator is plotted between load terminal voltage v_s armature current.



Characteristics of separately excited DC generator

(i) Its used in speed regulation tests.
(ii) Its also used in supplying power to the DC motors.
(iii) Laboratory and commercial testing used.

44. Which of the following is the correct equation to denote Hysteresis loss, W_h in a DC generator?

Given: η = Steinmetz Constant.
B = Flux Density
F = Frequency; and
V = Volume of the core

(a) $W_h = \eta B_m^{2.6} fV$ (b) $W_h = \eta B_m^{1.6} fV$
(c) $W_h = \eta B_m^{1.6} fV/3$ (d) $W_h = \eta B_m^{2.6} fV/2$

JSSC Electrician 19.09.2023

Ans. (b) : Hysteresis loss = $\eta B_m^{1.6} fV$ watt,

Electrical or copper losses	Core loss or Iron losses	Brush loss	Mechanical losses	Stray load losses

Method of reducing of Hysteresis loss-

In order to reduce the hysteresis loss, the armature core is made of materials having narrower B-H curve such as silicon steel.

Method of reducing of eddy current losses-

In order to reduce the eddy current loss, the armature core is built up of thin lamination which insulated from each with a coating of varnish.

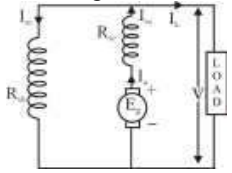
45. A long shunt compound generator has an armature, series field and shunt field resistances of 0.04 Ω, 0.03 Ω and 200 Ω respectively. It supplies a load current of 180 A at 400 V. Calculate the generated e.m.f. Assume contact drop/brush = 1 V.

(a) 207.37 V (b) 414.74 V
(c) 428.74 V (d) 829.48 V

MAHATRANSCO Technician-2023

Asn. (b) : Given that,

A long shunt compound generator-
Series field resistance (R_{se}) = 0.03 Ω
Shunt field resistance (R_{sh}) = 200 Ω
Armature resistance (R_a) = 0.04Ω
Load current (I_L) = 180 Amp
Terminal voltage (V_t) = 400 V
Contact drop/brush = 1 V



According to figure-

$$\boxed{I_a = I_{se} = I_{sh} + I_L}$$

Now,

$$\text{Shunt field current } (I_{sh}) = \frac{V}{R_{sh}}$$

$$I_{sh} = \frac{400}{200}$$

$$I_{sh} = 2 \text{ Amp}$$

$\therefore$ Armature current $(I_a) = I_{sh} + I_L$

$$I_a = 2 + 180$$

$$I_a = 182 \text{ Amp}$$

$\therefore$ Now,

$$E = V + I_aR_a + I_{se}R_{se} + \text{Brush drop}$$

$$E = 400 + 182 \times 0.04 + 182 \times 0.03 + 2 \quad \{I_a = I_{se}\}$$

$$E = 400 + 182\ (0.04 + 0.03) + 2$$

$$E = 400 + 182 \times 0.07 + 2$$

$$E = 400 + 12.74 + 2$$

$$E = 414.74 \text{ volt}$$

46. Stray losses are caused due to-

(a) Infinite flow of current
(b) Due to insulation
(c) Lamination
(d) Leakage of flux

MPESB Electrician-21.12.2022

Ans. (d) : Stray losses are caused due to leakage of flux. Stray loss is the sum of mechanical loss and iron loss.

Stray loss:- The combination of friction losses due to moving of bearing, shaft and windage losses due to air gap is called stray loss.

47. By which effect of electric current both generator and motor are working?

(a) Physical (b) Chemical
(c) Magnetic (d) Heating

IOCL Technical Attendent-12.09.2022
HPSSC Lineman instructor 15.07.2018

Ans. (c) : Magnetic effect of electric current both generator and motor are working.

■ An electric motor is a device that converts electrical energy into mechanical energy.

■ An electric generator is a device that converts mechanical energy into electrical energy.

48. Bearings are used for _____.

(a) Support and hold the shaft in fixed position
(b) Allow the shaft to run freely
(c) Minimize the rubbing action
(d) All the above

IOCL Technical Attendent-12.09.2022
Punjab Wireman Instructor 07.07.2013

Ans. (d) : Bearing are used for following region -

■ Support and hold the shaft in fixed position.
■ Allow the shaft to run freely.
■ Minimize the rubbing action.
■ To reduce the frictional losses.
■ In D.C machines ball bearing or roller bearing are commonly used.

49. How can we compensate for the demagnetizing effect of low induced emf in large machines?

(a) To provide compensating winding in series with the armature
(b) Increasing ampere turns in the field winding
(c) Providing compensating winding in parallel with the armature
(d) Reducing ampere turns in field winding

CPRI ITI Electrician-19.12.2022, 9:00-10:30AM

Ans. (a) : To provide compensating winding in series with the armature to compensate for the demagnetizing effect of low induced emf in large machine.

■ **Armature reaction :-** The effect of armature flux on the main field flux is known as armature reaction.

In order to reduce the effect of armature reaction following methods are used :-

(i) High reluctance pole tip
(ii) By increase the reluctance in the armature flux
(iii) strong main field flux
(iv) Interpole
(v) Compensating winding.

50. The number of armature parallel paths in a 4-pole D.C. generator having lap winding is.....

(a) 2
(b) 4
(c) 8
(d) 12

TRANSCO JLM-11.02.2018

Ans. (b) : The number of armature parallel path in a 4-pole D.C generator having lap winding is 4.

Lap winding :-

■ Lap winding the number of parallel paths is equal to the total number of poles.

$$\boxed{A = P}$$

■ The number of brushes is equal to the number of parallel paths.

Wave winding :-

■ Wave winding the number of parallel paths is always equal to two. $\boxed{A = 2}$

■ The number of brushes in wave winding is two.

51. The field coils of D.C. generator are usually made of.....

(a) Mica
(b) Copper
(c) Cast Iron
(d) Carbon

TRANSCO JLM-11.02.2018
RSMSSB Junior Instructor Electrician- 24.03.2019
UPPCL Electrician TG-2, 16.10.2016

Ans. (b) : The field coil of D.C generator are usually made of copper.

■ Field coil of D.C generator or motor is usually made of copper because it has good electrical conductivity, and good thermal conductivity.

Yoke :-

In small D.C machine it is made by cost iron but in case of large size machine it is made by cost steel and rolled steel.

Armature core :-

Armature core is made up of silicon steel material

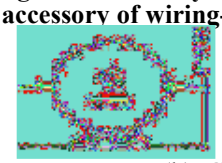
Pole and pole shoe:-

Pole and pole shoe is made of steel but the pole shoe is laminated.

Commutator :-

It is made of hard drown copper.

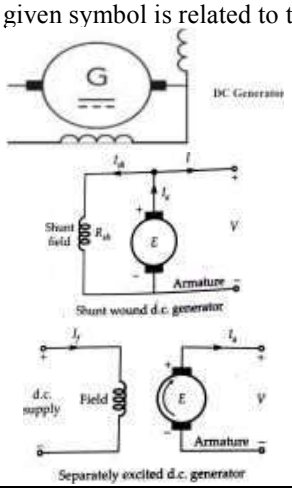
52. From the given below symbol identify the respective accessory of wiring-



(a) Generator (b) Guard
(c) Gate (d) Galvanometer

MPESB Electrician-21.12.2022

Ans. (a) : The given symbol is related to the generator.



53. What is the function of split rings in a DC generator?

(a) Supplies output continuously
(b) Generates output unidirectionally
(c) Generates output in the opposite direction
(d) Collects the output from alternate conductors
(e) Supplies output discontinuously

JVVNL Technical Helper-02.11.2022, 12:00-14:00 PM
Kerala PSC Wireman Instructor- 26.02.2016

Ans. (b) : Split rings are also known as commutator.
■ The function of split ring or commutators in a D.C generator generates output unidirectionally
■ It converts bidirectional signal into unidirectional signal.
■ It is made by hard drawn copper.
■ It is made in segmented form.
■ Each segment is insulated with a thin layer of mica.
■ The thickness of mica is 0.35 mm-0.50 mm
■ The number of commutator segment is equal to number of coil in the armature it acts as mechanical rectifier.

54. What is the cause of heavy sparking in the brushes of a DC generator?

(a) Short circuit in field winding
(b) Short circuit in armature winding
(c) Change in position of MNA
(d) To much spring tension at the brush
(e) Short circuit in field and armature winding

JVVNL Technical Helper-02.11.2022, 12:00-14:00 PM

Ans. (c) : The cause of heavy sparking in the brushes of a D.C generator due to change in position of MNA.
■ The sparking at the brushes in a dc machine is due to reactance voltage.
■ The effect of reactance voltage is the cause of sparking heating of the trailling brush tip and temperature rise of the commutator surface.

55. The armature core of a DC generator is made of..... lamination.

(a) Silicon steel (b) Copper
(c) Silver (d) Zinc
(e) Cobalt

JVVNL Technical Helper-02.11.2022, 12:00-14:00 PM
GSSSB Instructor Electrical- 15.11.2016
UPPCL TG-2, 15.01.2019 Shift-II

Ans. (a) : The armature core of a D.C generator is made of silicon steel lamination.
■ By adding silicon in the steel (2 to 5%) it reduces the conductivity and increases the resistance of material.
■ Due to which will reduce the eddy current loss without affecting the magnetic properties.
■ It also has low hysteresis coefficient, Hence hysteresis loss is also minimized.

56. The voltage equation of a DC long-shunt compound generator is-
(where E_g is generated EMF, V_t is terminal voltage, I_a is armature current, R_a is armature resistance, I_L is load current, R_{se} is series resistance, and V_{brush} is brush contact drop)

(a) $E_g = V_t + I_a R_a$
(b) $E_g = V_t - I_a R_a$
(c) $E_g = V_t + I_a (R_a + R_{se}) + V_{brush}$
(d) $E_g = V_t + I_a R_a + IL R_{se}$
(e) $E_g = V_t + I_a / R_a$

JVVNL Technical Helper-02.11.2022, 12:00-14:00 PM

Ans. (c) : The voltage equation of a D.C long-shunt compound generator is -

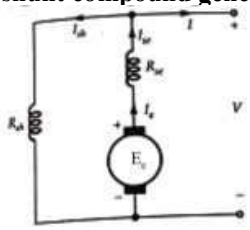
$$E_g = V_t + I_a (R_a + R_{se}) + V_{brush}$$

$$I_a = I_{sh} + I_L$$

Where -

E_g = Generated emf
V_t = Terminal voltage
I_a = Armature current
R_a = Armature resistance
I_L = Load current
R_{se} = Series resistance
V_{brush} = Brush contact drop

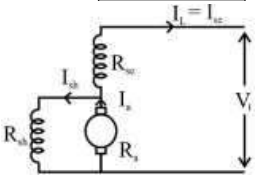
Long shunt compound generator



Short shunt compound generator :-
Voltage equation of D.C short shunt compound generator is-

$$E_g = V_t + I_a R_a + I_{se} R_{se} + \text{brush drop}$$

$$I_a = I_{sh} + I_{se}$$



57. The armature reaction of an unsaturated DC machine is-

(a) Cross- magnetization
(b) Demagnetization
(c) Both cross-magnetization and demagnetization
(d) Negligible
(e) None of the options

JVVNL Technical Helper-02.11.2022, 12:00-14:00 PM
UPRVUNL (TG-2) ,21.12.2022 Shift-I

Ans. (a) : The armature reaction of an unsaturated DC machine is cross-magnetization.
■ Before saturation of main field pole there is only cross magnetising effect of armature reaction. After saturation or saturated there is demagnetising and cross-magnetising effect both are observed.

58. The armature core of a DC generator is laminated to-

(a) Insulate the core
(b) Reduce eddy current loss
(c) Reduce mass
(d) Provide a passage for cooling air
(e) Reduce hysteresis loss

JVVNL Technical Helper-27.08.2022,12:00-2:00PM

Ans. (b) : The armature core of a D.C generator is laminated to reduce eddy current loss.
■ The armature core of a DC generator is made of silicon steel.
■ Eddy current are circulating currents that are induced in the conducting material (in this case, the armature core) when it is exposed to changing magnetic field.
■ In laminating armature core, it is divided into thin insulated layers, which effectively reduces the path for eddy current to flow and minimizes the associated power losses.

59. Wave winding is employed in a DC machine for-

(a) High current and low voltage rating
(b) Low current and high voltage rating
(c) High current and high voltage rating
(d) Low current and low voltage rating
(e) All of the options

JVVNL Technical Helper-27.08.2022,12:00-2:00PM

Ans. (b) : Wave winding is employed in a DC machine for low current and high voltage rating.
Wave winding :-
■ Wave winding used for high voltage and low current.
■ In wave winding the number of parallel path is always equal to two (A = 2)
■ Wave winding is incomplete winding. It is mechanically unbalanced. to make it balance, a dummy coil is used.
■ Number of brushes required is two.
Lap winding :-
■ Lap winding used for low voltage and high current.
■ Number of brushes are equal to number of parallel path (A = P = No. of brushes)
■ Number of parallel path is equal to number of pole (A = P)
■ Equalizer ring used to stop circulating current.

60. A four-pole dynamo, has 600 conductors in total and runs at 1000 rpm. It is lap wound and its flux/pole is 0.064 wb. Find the induced EMF.

(a) 160 V (b) 320 V
(c) 480 V (d) 640 V
(e) 256 V

JVVNL Technical Helper-27.08.2022,12:00-2:00PM

Ans. (d) : Given that-
Number of poles in (P) = 4
No. of parallel path (A) = 4
Speed of armature in RPM (N) = 1000
Magnetic flux per pole (ϕ) = 0.064 wb
Total no. of armature conductor (Z) = 600
Induced emf = ?

$$E_g = \frac{N\phi PZ}{60A}$$

$$E_g = \frac{1000 \times 0.064 \times 4 \times 600}{60 \times 4}$$

$$\boxed{E_g = 640V}$$

61. The open-circuit characteristic of DC generators is also known as a/an-

(a) Internal characteristic
(b) No-load saturation characteristic
(c) Total characteristic
(d) Performance characteristic
(e) External characteristic

UPPCL TG-2, 10.11.2023 Shift I
JVVNL Technical Helper-27.08.2022,12:00-2:00PM

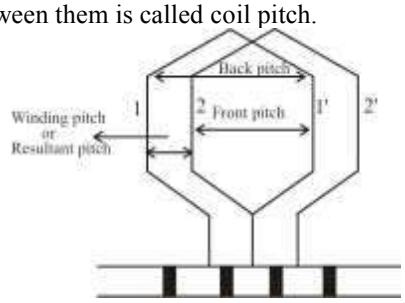
Ans. (b) : The open-circuit characteristic (o.c.c) is also known as magnetic characteristic or no load saturation characteristic.
■ This characteristic show the relation between generated emf at no-load (E_0) and the field current (I_F) at a given fixed speed (E_o V_S I_f).
Internal characteristics (E_g/I_a)
An internal characteristic curve show the relation between the on load generated emf (E_g) and the armature current (I_a).
External characteristics (V/I_L)
An external characteristic curve shows the relation between terminal voltage (v) and the load current (I_L).

62. The peripheral distance between two sides of a coil, measured in terms of the number of armature slots between them is called-

(a) Pole pitch (b) Coil pitch
(c) Back pitch (d) Front pitch
(e) Resultant pitch

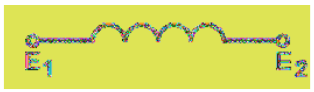
JVVNL Technical Helper-27.08.2022,12:00-2:00PM

Ans. (b) : The peripheral distance between two sides of a coil, measured in terms of the number of armature slots between them is called coil pitch.



Back pitch-The distance between two coil side of one coil is known as back pitch (Y_B).
Front pitch-The distance between two coil connected to same commutator segment is known as a front pitch (Y_F)
Winding pitch or resultant pitch - The distance between two consecutive coil side either top or bottom is known as winding pitch or resultant pitch.

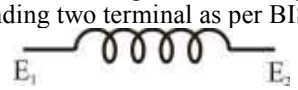
63. Identify the type of winding as per BIS 4718-1975.



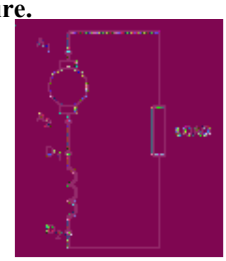
(a) Armature winding with two terminals
(b) Compensating winding with two terminals
(c) Shunt excitation winding with two terminals
(d) Commutating winding with two terminals
(e) Series excitation winding with two terminals

JVVNL Technical Helper-27.08.2022,12:00-2:00PM

Ans. (c) : The winding show in figure is shunt excitation winding two terminal as per BIS4718-1975.



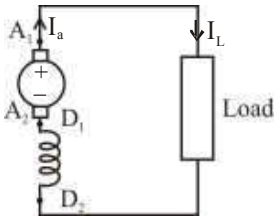
64. Identify the type of generator given in the below figure.



(a) Shunt generator
(b) Series generator
(c) Separately excited generator
(d) Long shunt compound
(e) Short shunt compound

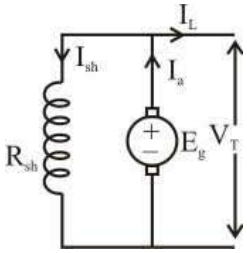
JVVNL Technical Helper-27.08.2022,12:00-2:00PM

Ans. (b) : Series type of generator given in the below figure.



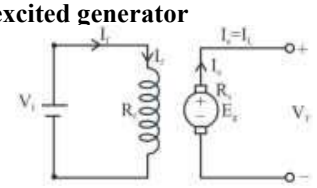
$I_a = I_L$

DC shunt generator



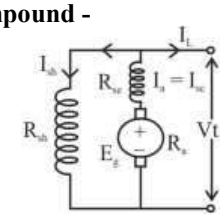
$I_a = I_{sh} + I_L$

Separately excited generator



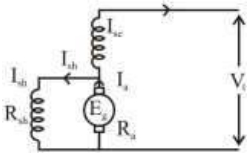
$I_a = I_L$

Long shunt compound -



$I_a = I_{sh} + I_L$

Short shunt compound -



$I_a = I_{sh} + I_{se}$

65. The polarity of the induced emf in the DC shunt generator depends on the _____.

(a) Direction of the induced voltage
(b) Residual magnetism
(c) Direction of field current
(d) Direction of rotation

ONGC Trade Electrician-20.08.2022
MPESB Electrician 22.12.2022

Ans. (d) : The polarity of the induced emf in the DC shunt generator depends on the direction of rotation.
■ If either one of the both is reverse the polarity changes.
■ If both are reversed the polarity remains unchanged.

66. A dc shunt generator has emf of 100 V when the useful flux per pole is 20 mWb and the speed is 800 rpm. What is the generated emf when flux per pole is 24 mWb at a speed of 1000 rpm?

(a) 120 V (b) 125 V (c) 150 V (d) 66.7 V

TSSPDCL Junior Lineman-17.07.2022

Ans. (c) : In a DC shunt generator, the relationship between induce emf and speed is - $E_g \propto N\phi$

Where,
Induced emf = (E_g)
Flux per pole = (ϕ)
Speed = N

Given that-

$E_1 = 100V$, $\phi_1 = 20$ mWb, $N_1 = 800$rpm
$\phi_2 = 24$mwb, $N_2 = 1000$rpm, $E_2 = ?$

$$\frac{E_1}{E_2} = \frac{\phi_1 N_1}{\phi_2 N_2}$$

$$\frac{100}{E_2} = \frac{20 \times 800}{24 \times 1000}$$

$$E_2 = 150V$$

67. If the magnetic flux produced by the series winding assists the flux produced by the shunt field winding, the DC generator is said to be:

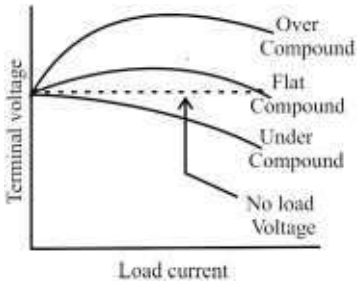
(a) Cumulatively Compounded generator
(b) Long shunt compounded generator
(c) Differentially Compounded generator
(d) Short shunt compound generator

UPRVUNL (TG-II) 21.12.2022, Shift-I

Ans. (a) : If the magnetic flux produced by the series winding assists the flux produced by the shunt field winding, the DC generator is said to be commulatively compound generator.

■ Commulative compound generator are used for supplying power to DC motor.

■ Commulative compound generator are used for lighting, power supply purpose and for heavy power services.



68. Shaft torque less than the armature torque in a DC series motor. Why?

(a) Hysteresis losses
(b) Eddy current losses
(c) Copper losses
(d) Stray losses

UPRVUNL (TG-II) 21.12.2022, Shift-I

Ans. (d) : Shaft torque less than the armature torque in a DC series motor due to stray losses.

■ The shaft torque in a DC series motor is always less than the armature torque because the back emf of the motor opposes the torque developed by the armature.

■ The speed of the motor increases, the back emf also increases which reduces the torque on the shaft.

■ The armature current, which is responsible for the torque on the shaft decreases as the speed of the motor increases. The result in a decreases in torque on the shaft making it less then the armature torque.

69. A separately excited DC generator can be:

(a) Voltage excited or current excited
(b) Current excited or permanent magnet excited
(c) Permanent magnet excited only
(d) Permanent magnet excited or voltage excited

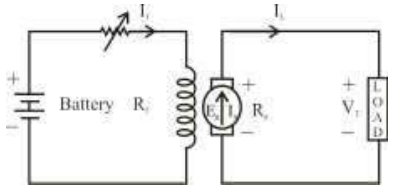
UPRVUNL (TG-II) 21.12.2022, Shift-I
LMRC Maintainer Electrical Exam-2016

Ans. (a) :A separately excited DC generator can be voltage excited or current excited.

Separately Excited DC Generator-

■ A separately excited DC generator is the one whose field winding is supplied by on independent external DC source.

■ The magnitude of generated voltage depends upon the speed of rotation of armature and the field current i.e greater the speed and the field current, higher is the generated voltage.



Armature current $I_a = I_L$
Terminal voltage $V_T = E_g - I_aR_a$
Developed electric power = E_gI_a
Power delivered to load = $E_gI_a - I_a^2R_a = V_TI_a = V_TI_L$.

70. Which of the following statement is NOT TRUE for Armature reaction?

(a) Armature flux strengthen the main flux
(b) Distortion of the main field flux along the air gap periphery called as cross magnetizing effect.
(c) Cross magnetizing leads to sparking in the brushes
(d) Net reduction in the main flux called as demagnetizing effect

UPRVUNL (TG-II) 21.12.2022, Shift-I

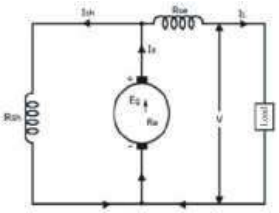
Ans. (a) : Armature flux strengthen the main flux is not correct for armature reaction.

Armature reaction- The armature flux distorts and weakens the magnetic flux produced by the main poles. This effect of armature flux on the main flux is known as armature reaction.

The armature reaction has two effects-

(i) demagnetizes or weakness the main flux.
(ii) cross-magnetizes or distorts it.

71.



The DC generator shown in above figure is a:

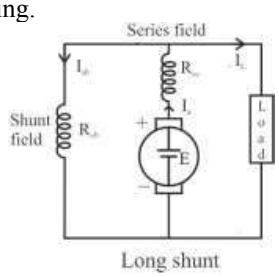
(a) Short shunt DC compound generator
(b) Simple shunt DC Generator
(c) Long shunt DC compound generator
(d) Simple series DC Generator

UPRVUNL (TG-II) 21.12.2022, Shift-I
UPPCL TG-2, 27.03.2021

Ans. (a) : The DC generator shown in above figure is a short shunt DC compound generator.

■ Short shunt compound dc generator is in which only shunt field winding is in parallel with the armature winding.

■ Long shunt compound dc generator is in which shunt field winding is in parallel with both series field and armature winding.



72. When magnetic reversals are increased in dc generators, which loss will increase rapidly?

(a) Hysteresis loss (b) Friction loss
(c) Copper loss (d) Eddy current loss

UPRVUNL (TG-II) 21.12.2022, Shift-I

Ans. (a) : When magnetic reversals are increased in dc generators, then hysteresis loss will increase rapidly.

Hysteresis loss in DC generator- The loss that occurs in core of the armature of a dc machine due to magnetic field reversal in the armature core when it passes under the successive magnetic pole of different polarity is called hysteresis.

hysteresis loss $(P_h) = K_h\ B_{max}^{1.6}\ f\ v$

where K_h = steinmetz's hysteresis coefficient.
B_{max} = maximum flux density
f = frequency
V = volume of armature core

73. In a DC generator armature lap winding, how many parallel paths must be there?

(a) Triple the number of poles
(b) Half the number of poles
(c) Double the number of poles
(d) Equal to number of poles

UPRVUNL (TG-II) 21.12.2022, Shift-I

Ans. (d) : In a DC generator armature lap winding, the number of parallel paths must be equal to number of poles.

$$\boxed{A = P}$$

In a DC generator armature wave winding the number of parallel path must be equal two.

$$\boxed{A = 2}$$

74. Which of the following is NOT effect of armature reaction in DC generator?

(a) Reduction in generated EMF
(b) Commutation problem
(c) Shifting of magnetic neutral axis
(d) Increase in number of poles

UPRVUNL (TG-2) 21.12.2022, Shift-II

Ans. (d) : Increase in number of poles is not effect of armature reaction in DC generator.

Effect of armature reaction-

- The total magnetic flux created by each pole is reduced.
- The MNA (magnetic neutral axis) is shifted in the direction of rotation of the armature this shifting of MNA is due to shifting in the axis of resultant flux.
- The armature causes a magnetic flux in the neutral zone. This flux in the neutral zone induces a voltage in armature which causes commutation problem.

Methods of reducing armature reaction in D.C generator:–

- Using laminated poles.
- Punching rectangular holes in field poles.
- Stronger main field flux as compared to armature flux.
- Using compensating windings
- Using interpoles.

75. A 6-pole, lap wound DC generator has 800 conductors on its armature. The flux per pole is 0.035 Wb. The speed of rotation of the armature is 1500 RPM. Calculate the generated EMF?

(a) 1400V (b) 350V
(c) 700V (d) 1050V

UPRVUNL (TG-2) 21.12.2022, Shift-II

Ans. (c) : Where,
No. of poles (P) = 6
Flux (ϕ) = 0.035 Wb
Total No. of conductors (Z) = 800
Rotational speed of armature rpm (N) = 1500 rpm
No. of parallel path in armature (A) = 6
for a lap wound generator
A = P
Generated emf (E_g) = ?
E.m.f equation of generator is given as follows

$$E_g = \frac{N\phi PZ}{60A}$$

$$E_g = \frac{1500 \times 0.035 \times 6 \times 800}{60 \times 6}$$

$E_g = 500 \times 0.035 \times 40$
$E_g = 700$ V

76. In DC generator armature is simplex wave winding, how many parallel paths must be there?

(a) Double the number of poles
(b) two
(c) Half the number of poles
(d) Equal to number of poles

UPRVUNL (TG-2) 21.12.2022, Shift-II

Ans. (b) : In D.C generator armature number of parallel path in simplex wave winding is 2.

$$\boxed{A = 2m}$$

Where, m = multiplicity
m = 1for simplex
m = 2 for duplex
m = 3 for triplex
$\therefore$ $A = 2 \times 1$

$$\boxed{A = 2}$$

77. In a DC Generator, Poles are joined to the Yoke with the help of:

(a) Groove and brazing (b) Electrical wire
(c) Rivet and soldering (d) Bolts and welding

UPRVUNL TG-2 22.12.2022, Shift-II

Ans. (d) : In a DC generator, poles are joined to the yoke with the help of Bolts and welding.

Yoke– It is the outer covering part of the DC generator and is made of cost steel or cost iron. It serves two purposes.

- Provides a path for pole flux.
- Provides mechanical support to the whole machine.

Part	Material
Yoke	Cast steel
Pole core and Pole Shoe	Cast steel
Armature core	Laminated steel
Commutator	Hard drawn copper
Brushes (Small machine)	Copper or carbon

78. Read the following statements for armature reactions in DC machines and select the correct option.
Statements 1. Net reduction in the main flux called as cross magnetizing effect.
Statements 2. Distortion of the main field flux along the air gap periphery called as demagnetizing effect.

(a) Statements 1 is false and Statements 2 is true
(b) Statements 1 is true and Statements 2 is false

(c) Both the Statements are true
(d) Both the Statements are False

UPRVUNL TG-2 22.12.2022, Shift-II

Ans. (d) : Both the statements are false.

Armature Reaction :

- The effect of armature flux on the main field flux distortion in the air gap is called armature reaction.
- The armature mmf produces two undesirable effect on the main flux.

(a) Net reduction in the main field.
(b) Distoration of the main field flux wave along the air gap periphery.

- The effect of armature flux on the main field is cross-magnetizing as well as demagnetizing.

79. Armature of a DC machine is made of

(a) conducting material (b) insulating material
(c) non-ferrous material (d) silicon steel

KPSC Electrician– 07.05.2022

Ans. (d) : Armature of a DC machine is made of silicon steel.

Armature core is a rotating cylindrical part of D.C. machine. It is made from circular stampings of silicon steel 0.3 to 0.5 mm thickness.

Function of Armature core–

(i) It supports the conductors by holdings the coil winding in its slots.

(ii) It provides very low reluctance path for the magnetic fluxes.

80. The no load voltage of a generator is 230 V and the rated load voltage is 200 V, then the voltage regulation is:

(a) 5% (b) 10%
(c) 15% (d) 20%

ISRO (VSSC) Technician (B) 21.02.2015

Ans. (c) : This is percentage rise in terminal voltage form No-load to full load expressed as rated full load voltage.

$$\text{Voltage regulation} = \frac{\text{No load voltage} - \text{full load voltage}}{\text{Full load voltage}}$$

$$\%\text{V.R.} = \frac{230 - 200}{200} \times 100$$

$$\%\text{V.R.} = 15\%$$

- During the no-load conditions the DC series generator has the poorest voltage regulation.
- During on load conditions, a differentially compounded DC generator has the poorest voltage regulation.

81. What is the emf equation of D.C generator?

(a) ϕNZP/60A volt (b) ϕNZP/60 Volt
(c) NZP/60A volt (d) ϕNZP/A volt

UPPCL TG-2, 28.03.2021 Shift I
HPSSC Hamirpur Electrician Instructor-13.10.2019
UPPCL TG-2, 24.01.2019, Shift-I
NMRC Maintainer-14.09.2019
Technical Helper-28.08.2018, Shift-I
MP Line Attendant-24.08.2018
PGCIL Tech- 14.11.2018
ISRO Tech-27.11.2016
HAL Electrician- 2015

Ans : (a) Emf equation of D.C generator

$$E = \frac{\phi NZP}{60A} \text{ volt}$$

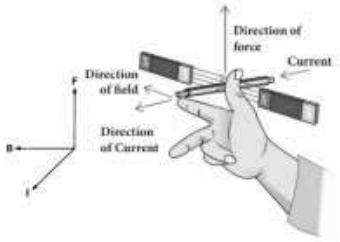
Where -
P = No. of poles
A = No. of parallel path
ϕ = Magnetic flux per pole
N = Speed of armature
Z = Total No. of armature conductors

82. In the case of electric generators, the direction of the induced emf can be obtained by using-

(a) Fleming's right hand rule
(b) Fleming's left hand rule
(c) Ohm low
(d) Right hand thumb rule

UPRVUNL TG-2, 14.07.2021 Shift II
UPPCL TG-2, 14.07.2021 Shift-I
UPPCL TG-2, 15.07.2021 Shift-I
KPSC Lineman Exam- 19.01.2021
KPSC Junior Instructor-19.08.2019

Ans. (a) : The direction of the induced EMF can be obtained by using Fleming' s right hand rule



- Fleming's right hand rule is used to find the direction of induced e.m.f or current in a generator

Flemings right hand rule :-

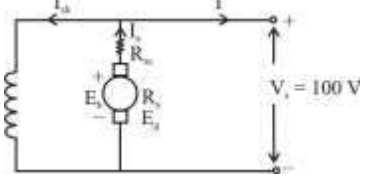
Fleming's right hand rule states that if we arrange our thumb, fore finger and middle finger of the right-hand perpendicular to each other, then the thumb points towards the direction of the motion of the conductor relative to the magnetic field, the forefinger points towards the direction of the magnetic field and the middle finger points towards the direction of the induced current.

83. A long shunt compound generator delivering a load current 100 A at 500 V has armature, series field and shunt field resistances as 0.1 Ω, 0.03 Ω and 200 Ω respectively. What is the armature current?

(a) 97.5 A (b) 100 A
(c) 102.5 A (d) 105 A

ISRO (VSSC) Technician (B) 25.09.2016

Ans. (c) : Given,
Load current (I_L) = 100A
Terminal voltage (V_T) = 500V
Series resistance (R_{se}) = 0.1Ω
Armature resistance (R_a) = 0.03Ω
Field resistance (R_{sh}) = 200Ω



$$I_{sh} = \frac{V_T}{R_{sh}} = \frac{500}{200} = 2.5A$$

$$I_a = I_{sh} + I_L = 2.5 + 100 = 102.5A$$

84. In which material the brushes of DC generator are made?

(a) Bronze
(b) Gunmetal
(c) Carbon and graphite
(d) Zinc Carbide

ISRO (VSSC) Technician (B) 25.09.2016

Ans. (c) : The brushes of dc generators are made of carbon and graphite these are rectangular block shaped.

■ The only function of these carbon brushes of DC generator is to collect current from commutator segments.

■ The brushes are housed in the rectangular box shaped brush holder or brush box.

85. The DC and AC generators are similar in one important function, that is the:

(a) Generated emf is DC
(b) Generated emf is AC
(c) Generated emf is pulsating current
(d) Generated emf is an oscillating current

ISRO (VSSC) Technician (B) 25.09.2016

Ans. (b) : The DC and AC generators are similar in one important function generated emf in AC.

Some major difference between AC and DC generator are following.

AC generator	DC generator
The current reverses direction periodically	The current flows only in one direction
The AC generator does not have commutators	DC Generators have commulators to make the current flow in one direction only.
AC Generators have slip rings	DC Generators have commutators.
The initial cost of a AC generator is high	The initial cost of a DC generator is low.
Generators are very efficient as the energy losses are less.	Generators are less efficient due to sparking and other losses like copper, eddy current

86. In a D.C. machine, the number of commutator segments is equal to …… .

(a) Number of conductors
(b) Twice the number of poles
(c) Number of coils
(d) None of the above

ISRO (VSSC) Technician (B) 25.09.2016

Ans. (c) : In a DC machine the number of commutator segments is equal to number of coils.

Commutator segments:

■ The purpose of the commutator is to rectify the AC waveform.
■ The segments of the commutator are insulated from each other and the armature shaft.
■ Wires from the armature are connected to armature segments.
■ Armature current is conducted from the commutator to the load by carbon brushes.
■ To help produce a smooth dc output, more coils and commutator segment are used.

87. In electrical machines, laminated cores are used with a view to reduce:

(a) Hysteresis loss (b) Eddy current loss
(c) Copper loss (d) None of the above

ISRO (SAC Ahmedabad) Technician (B) 01.07.2018
DMRC Maintainer- 17.04.2018, 9:00-10:30
RSMSSB Instructor Wireman-24.03.2019
RRB Jammu Srinagar (LP)- 2010
KPSC Instructor Electrician- 16.09.2020
ALP Technician 23.01.2019, 4:30- 7:00
Technical Helper- 29.08.2018, Shift-II
Haryana Shifting Asst.-2016, Shift-II

Ans. (b) : In electrical machines, laminated cores are used to reduce eddy current loss.

■ **Eddy current or Foucault currents-**

The induced circulating (looping) currents produced in a solid metal due to change in magnetic field. (magnetic flux) in the metal are called eddy currents.

■ On applying an alternating magnetic field to a magnetic material an emf is induced in the material itself according to Faraday's law of electromagnetic induction.

■ They will occur when the conductor experiences a changing magnetic field.

■ As these currents does not do any useful work, and it produces I^2R loss in the magnetic material is known as an Eddy current loss.

■ Eddy current flow in closed loops within core, in planes perpendicular to the magnetic field.

■ If the core is made up to solid iron of larger cross-sectional area, the magnitude of eddy current will be very large and hence losses will be high.

■ **To reduce the eddy current loss mainly there are two methods-**

1. The magnitude of the current can be reduced by splitting the solid core into thin sheets called laminations.

2. The eddy current loss is also reduced by using a magnetic material having ferrites.

$$\text{Eddy current loss}(p_e) = k_e B_m^2 f^2 t^2 v \text{ watt}$$

Where,

$P_e \rightarrow$ Eddy current loss (watt)
$B_m \rightarrow$ Maximum Flux density (wb/m^2)
$f \rightarrow$ Frequency of supply (Hz)
$t \rightarrow$ Thickness of lamination (meter)
$v \rightarrow$ Volume of material (m^3)
$k_e \rightarrow$ Eddy current constant.

$$\text{Hysteresis loss } (P_h) = K_h (B_{max})^{1.6} \times f \times v \text{ watt}$$

$P_h \rightarrow$ Hysteresis loss (Watt)
$K_h \rightarrow$ Steinmetz's constant
$B_{max} \rightarrow$ maximum flux density (W_b/m^2)
$f \rightarrow$ supply frequency (Hz)
$v \rightarrow$ volume of the materials (m^3)

88. Which part of the DC generator is used for supporting the pole cores and provides mechanical protection to the inner parts of the machines?

(a) Armature core (b) Yoke
(c) Pole core (d) Shaft

UPPCL TG-2, 28.03.2021 Shift I

Ans : (b) Yoke of the D.C generator is used for supporting the pole cores and provides mechanical protection to the inner parts of the machines.

■ For small machine the yoke is made by cost iron and large machine yoke is made by cost steel or rolled steel.

■ It provides flux path completion $\left(\frac{\phi}{2}\right)$ therefore yoke should be good magnetic material.

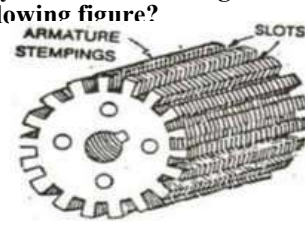
89. Which part of the DC generator does not consist of a magnetic field system?

(a) Pole core (b) Exciting coils
(c) field core (d) Armature core

UPPCL TG-2, 28.03.2021 Shift I

Ans : (d) The DC generator does not consist of a magnetic field system is armature core.
■ It is cylindrical in shape with slots to carry armature winding and it doesn't consist any magnetic field system.
■ Armature core contain armature winding on it the slots provide mechanical security to the winding.
■ The armature core is made up of silicon steel material.

90. Identify the Part of DC generator is given in the following figure?



(a) Armature commutator (b) Field core
(c) Armature core (d) Armature winding

UPPCL TG-2, 28.03.2021 Shift I

Ans : (c) The part of D.C generator is given in the following figure of armature core.
■ The armature core is made up of silicon steel material.
■ Armature core generally cylindrically drum type, which is punched into slot periphery.

91. In self-excited DC generator, the residual magnet is available at?

(a) Field winding (b) Commutator
(c) Carbon brushes (d) Armature winding

UPPCL TG-2, 10.11.2023 Shift I
UPPCL TG-2, 28.03.2021 Shift I

Ans : (a) In self-excited DC generator, the residual magnet is available at field winding.
■ Once it is destroyed, it can be restored by connecting its field winding to a DC source for a short time to magnetize the poles.

92. Identify the machine whose part are the armature core, shaft, yoke and commutator.

(a) DC generator
(b) Synchronous generator
(c) Slip-ring induction generator
(d) Squirrel - cage in the generator

UPPCL TG-2, 28.03.2021 Shift II

Ans (a) : The part of the DC generator are the armature core, shaft, yoke and commutator.
Armature core :-
■ The armature core is made up of silicon steel material.
■ Armature core generally cylindrically drum type which is punched into slot periphery.
Yoke :- Yoke of the DC generator is used for supporting the pole cores and provides mechanical protection to the inner parts of machine.
■ For small machine the yoke is made by cost iron and large size machine yoke is made by cost steel.
Commutator or split ring :-
■ It is made by hard drown copper.
■ It is made in the segmented form.
■ Each segment is insulated with a thin layer of mica.
■ Mica is harder than copper.
■ It converts bidirectional signal into unidirectional signal.
■ It acts as a mechanical rectifier.

93. Which component of DC generator is applied to the commutator, which collects the current from the armature winding ?

(a) Shaft (b) Inter pole
(c) Armature core (d) Corbon brush

UPPCL TG-2, 28.03.2021 Shift II

Ans (d) :The carbon brush of DC generator is mounted on the commutator, which collects the current from the armature winding.
■ Carbon brushes are usually made of carbon.
■ The resistance of carbon is greater than the resistance of copper. Due to which sparking does not occur. And also the carbon brush acts as a lubricant for the commutator.
■ The carbon brush contact drop is 2.0 volt.
■ For graphite it is 0.5 volt.
■ No. of brushes = No. of parallel path.

94. In a DC shunt generator with 4 poles, 20kW, and 180V wave winding, the current in each parallel path will be-

(a) 75.6 A (b) 65.5 A
(c) 111.11 A (d) 55.55 A

UPPCL TG-2, 19.03.2021 Shift II

Ans : (d) The no. of the parallel path for the wave wound generator = 2

So, the current in each parallel path = $\frac{I}{2}$

Given that-

$P = 20kW, V = 180V$

$\boxed{P = VI}$

$20\times10^3 = 180\times I$

$I = \frac{20\times10^3}{180}$

$I = 111.11\ A$

The current in each parallel path = $\frac{I}{2}$

$\frac{111.11}{2} = 55.55A$

95. Find the EMF produced by a DC generator connected to a 6 poles coil rotating at 1200 RPM. its flux per pole is 0.3 mwb and the total number of armature conductors is 1000.

(a) 18 V (b) 8 V
(c) 9 V (d) 6 V

UPPCL TG-2, 19.03.2021 Shift II

Ans : (a) Given, In generator
Speed (N) = 1200 RPM
Pole (P) = 6
Flux (ϕ) = 0.3 mWb
$= 0.3\times10^{-3}$ Wb
No. of conductor (Z) = 1000
Induced emf (E_g) = ?

Formula $\boxed{E_g = \frac{\phi ZNP}{60A}}$

Assuming (A) = 2 (for wave winding)

$$E_g = \frac{0.3\times10^{-3}\times1000\times1200\times6}{60\times2}$$

$$\boxed{E_g = 18V}$$

Assuming (A) = P (for lap winding)

$$E_g = \frac{0.3\times10^{-3}\times1000\times1200}{60}$$

$$\boxed{E_g = 6V}$$

Note:- Lap or wave winding was not given in the question by the commission but option (a) has been considered by the commission.

96. Which of the following is not a constant loss of a DC generator ?

(a) Iron loss (b) Shunt field loss
(c) Copper loss (d) Mechanical loss

UPPCL TG-2, 19.03.2021 Shift II

Ans : (c) Copper loss is not a constant loss of a DC generator.
But copper loss is variable loss and iron loss, shunt field copper loss and mechanical is a constant loss.

97. Which of the following generators has very low voltage regulation ?

(a) Shunt generator
(b) Series generator
(c) Differential compound
(d) Cummulative compound generator

UPPCL TG-2, 19.03.2021 Shift II

Ans : (b) Series generator has very low voltage regulation.
■ Series generator is negative voltage regulation
■ Shunt, separately and under compound generator is positive voltage regulation.
Order of voltage regulation in descending order :-
Series > Differential > Over compound > Shunt > separately > Under compound > Flat compound
Voltage regulation :-
This is percentage rise in terminal voltage form No-load to full load expressed as rated full load voltage.

$$\% \text{ voltage regulation} = \frac{E - V}{V}\times100$$

98. A 6 pole DC generator wave wound has 600 conductors on its armature. if flux per pole is 0.02 wb, calculated generator speed running for producing 300V. ?

(a) 500 RPM (b) 1500 RPM
(c) 1000 RPM (d) 1200 RPM

UPPCL TG-2, 19.03.2021 Shift II

Ans : (a) Given, P = 6, A = 2 (wave winding),
Z = 600
ϕ =0.02 wb
E_g = 300 Volt
N=?

Formula- $\boxed{E_g = \frac{\phi ZNP}{60A}}$

$$300 = \frac{0.02\times600\times N\times6}{60\times2}$$

$$\boxed{N = 500\,RPM}$$

99. The armature of a 6-pole DC generator has a wave winding with 600 conductors. If the flux per pole is 0.05 wb and the speed is 250 RPM. then the emf generated is :-

(a) 563.5 V (b) 375 V
(c) 200 V (d) 498 V

UPRVUNL TG-2, 14.07.2021 Shift II

Ans. (b) : Given,
Z = 600, A = 2, P = 6
ϕ = 0.05 Wb N = 250 rpm
Emf equation of generator

$$E_g = \frac{P\phi ZN}{60A}$$

$$= \frac{6\times0.05\times600\times250}{60\times2} \quad \text{[Wave winding A = 2]}$$

$$= \frac{45000}{120}$$

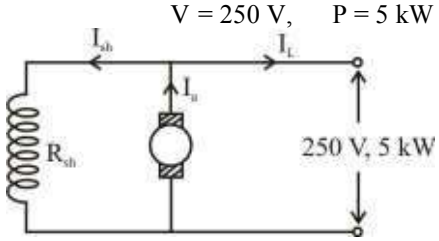
$$\boxed{E_g = 375 \text{ volt}}$$

100. In a DC shunt generator, shunt field winding resistance of 100Ω. It is supplying a load of 5kW at a voltage of 250V. If the armature resistance is 0.22Ω, calculate the induced (EMF) of the generator, assuming the brush voltage is negligible.

(a) 322.69 V (b) 255V
(c) 50 V (d) 152.32 V

UPRVUNL TG-2, 14.07.2021 Shift II

Ans. (b) : Given,
R_{sh} = 100 Ω, R_a = 0.22 Ω
V = 250 V, P = 5 kW



$$I_{sh} = \frac{250}{100} = 2.5\ A$$

$$I_L = \frac{5\times1000}{250} = 20A$$

Armature current $(I_a) = I_L + I_{sh}$
$= 20 + 2.5$
$= 22.5$ A

From $\boxed{E_g = V + I_a R_a}$
$= 250 + 22.5 \times 0.22$
$= 250 + 4.95$

$$\boxed{E_g = 255 \text{ volt}}$$

101. Induced EMF at full load in a 250V, 10-kW, separately excited generator is 255V. If the armature brush drop per brush is 2V, calculate the load current of the generator.

(a) 20 A (b) 30A
(c) 40 A (d) 10 A

UPRVUNL TG-2, 14.07.2021 Shift II

Ans. (c) : Given that,
P = 10 kW, V = 250 volt, E_b = 255 volt
Brush drop = 2V, I_L = ?

Armature current $\boxed{I_a = \frac{P}{V}}$

$$I_a = \frac{10 \times 1000}{250}$$

$I_a = 40A$

Separately excited generator equal to armature current and load current.

$\therefore$ $\boxed{I_L = 40A}$

102. A 4-pole, lap-wound DC generator has a useful flux of 0.06 wb per pole. When it is rotated at a speed of 500 RPM with the help of a prime mover, calculated the generated Emf. the armature has 200 conductors.

(a) 138.62 V (b) 462 V
(c) 100 V (d) 166.67 V

UPRVUNL TG-2, 14.07.2021 Shift II

Ans. (c) : Given,
P = 4, ϕ = 0.06 Wb
N = 500 rpm, Z = 200
E_b = ?

$$\boxed{E_b = \frac{P\phi ZN}{60A}}$$

$$E_b = \frac{4 \times 0.06 \times 200 \times 500}{60 \times 4}$$

{A = P Lap winding}

$$= \frac{0.06 \times 200 \times 500}{60} = \frac{6 \times 2 \times 500}{60}$$

E_b = 100 volt

103. From the following options, select the difference between an AC generator and a D.C generator.

(a) In a DC generator, the armature rotates, and the field system is stationary, for AC generators, exactly the opposite happens.
(b) In an AC generator, the armature rotates, and the field system is stationary, for DC generators, the exact opposite is
(c) In a DC generator, there is no armature
(d) In a DC generator, the magnetic field exists alternately.

UPRVUNL TG-2, 14.07.2021 Shift II

Ans. (a) : The difference between an ac generator and a D.C generatorin a DC generator, the armature rotates, and the field system is stationary, for AC generators, exactly the opposite happens.

104. In the case of the electric generator_____ has grooves on its circumference and air ducts allow air to flow through the armature, which serves the cooling purpose.

(a) Yoke (b) Armature core
(c) Shaft (d) Pole shoes

UPRVUNL TG-2, 14.07.2021 Shift II

Ans. (b) : In the case of the electric generator, the armature core has grooves on its circumference and air ducts allow air to flow through the armature, which serves the cooling purpose.

105. A 4-pole, lap-wound DC generator has a useful flux of 0.05 wb per pole. When it is rotated at a speed of 500RPM with the help of a prime mover, calculate the generated emf. the armature has 400 conductors.

(a) 166.67 V (b) 462 V
(c) 57.589 V (d) 138.62 V

UPRVUNL TG-2, 15.07.2021 Shift I

Ans (a) : Given,
P=4, ϕ = 0.05Wb, N= 500 RPM, Z=400

$$\boxed{E_g = \frac{P\phi ZN}{60A} \text{ volt}}$$

$$E_g = \frac{4 \times 0.05 \times 400 \times 500}{60 \times 4}$$ {For Lap wound A=P}

$$= \frac{4 \times 5 \times 5 \times 400}{240} = \frac{20 \times 5 \times 400}{240} = \frac{40000}{240}$$

$\boxed{E_g = 166.67 \text{ Volt}}$

106. The 'flat compound characteristic' of a DC compound generator is obtained by:

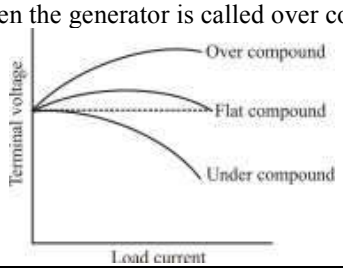
(a) connecting a fixed resistance across series field
(b) connecting a variable resistance in parallel with shunt load
(c) connecting a variable resistance across series field
(d) connecting a fixed resistance in parallel with shunt load

UPRVUNL TG-2, 14.07.2021 Shift I

Ans (c) : The flat compound characteristics of a DC compound generator is obtained by connecting a variable resistance across series field.

■ If the series field winding has less number of turns then the rated terminal voltage become less than the no-load voltage, then the generator is called under compounded.

■ If the series turns are so adjusted that with the increase in load current the terminal voltage also increases then the generator is called over compounded.



107. An 8-pole DC generator has 960 armature conductors and 20 mWb per pole flux running at 500 rpm. if the armature is connected as a simplex lap-coil, calculate the produced emf.

(a) 180 V (b) 140 V
(c) 160 V (d) 120 V

UPPCL TG-2, 27.03.2021 Shift I

Ans (c) : Given,
$\phi = 20 \times 10^{-3}$ Wb, N = 500 r.p.m.
Z = 960 E_g = ?
P = 8
A = 8

For lap winding-
A = P

Formula $\boxed{E_g = \frac{P\phi ZN}{60A}}$

$$E_g = \frac{960 \times 20 \times 10^{-3} \times 500 \times 8}{60 \times 8}$$

$$E_g = \frac{96 \times 5 \times 2}{6}$$

$$\boxed{E_g = 160V}$$

108. The field coils of a 6-pole DC generator each having 500 turns, are connected in series. When the field is excited, there is a magnetic flux of 0.2 wb/pole. If the field circuit is opened in 0.02 seconds and residual magnetism is 0.002 wb/pole, then calculate the average voltage that is induced across the field terminals.

(a) 8500 V (b) 5 kV
(c) 2420.23 V (d) 16.2 kV

UPRVUNL TG-2, 15.07.2021 Shift II

Ans (d) : Given,

$P = 6$, $N = 6 \times 500 = 3000$ turns

$\phi_{initial} = 6 \times 0.02 = 0.12Wb$

$\phi_{residual} = 6 \times 0.002 = 0.012Wb$.

$d\phi = 0.12 - 0.012$

$= 0.108\,Wb$

$dt = 0.02\,sec$

$$\boxed{E = N\frac{d\phi}{dt}}$$

$$E = 3000 \times \frac{0.108}{0.02}$$

$$= 16200V$$

$$\boxed{E = 16.2kV}$$

109. What will happen to a DC series motor if the series windings are shunted by a variable resistance ?

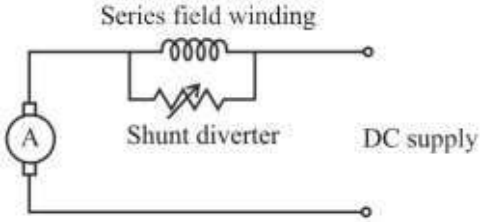
(a) The speed of the motor will decrease
(b) The speed of the motor will increase
(c) The iron losses in the motor will increases
(d) The leakage flux will be reduced to zero

UPRVUNL TG-2, 15.07.2021 Shift II

Ans (b) : DC series motor if the series windings are shunted by a variable resistance the speed of the motor will increase.

■ By connecting a variable resistance across the series field winding the current flowing in the field winding get reduces which reduces the flux and increases the speed.

$$\uparrow N \propto \frac{1}{\phi\downarrow}$$



110. In DC generators, commutation can be improved by which of the following?

(A) Using inter poles
(B) Shifting brush axis in direction of rotation of armature

(a) Only (A) (b) Both (A) and (B)
(c) Neither (A) nor (B) (d) Only (B)

UPPCL TG-2, 20.03.2021 Shift I

Ans (b) : DC generator, commutation can be improved by using inter poles and shifting brush axis in direction of rotation of armature.

111. If _____ then DC will stop the generator voltage generation process.

(a) The value of the field resistance become less than the critical value
(b) The value of the field resistance increase more than the critical value
(c) The value of the field resistance is as low as the value of the armature resistance
(d) The field resistance decreases to almost zero

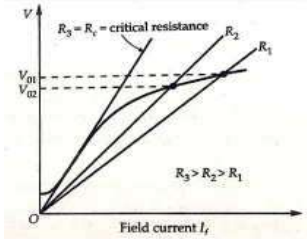
UPPCL TG-2, 20.03.2021 Shift I

Ans (b) : If the value of the field resistance increase more than the critical value then DC will stop the generator voltage generation process.

■ Condition for voltage build up process in DC generator the field winding resistance must be less than the critical field winding resistance.

■ The speed of the prime mover must be greater than the critical speed.

■ The critical field winding resistance depends on the speed.



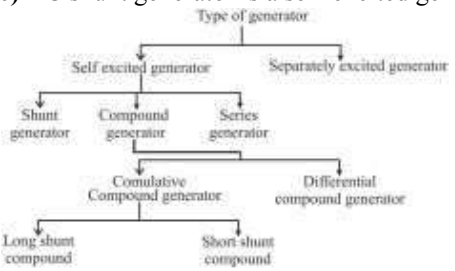
Effect of field resistance on no-load voltage.

112. DC shunt generator is a

(a) Separately excited generator
(b) Parallel-series excited generator
(c) Self - excited generator
(d) Series excited generator

UPPCL TG-2, 19.03.2021 Shift I
HSSC ALM- 14.03.2020 Shift-II

Ans : (c) DC shunt generator is a self-excited generator.



113. A 100kW, 200V long shunt cummulative compound has negligible armature resistance. What will be the value of the supplied current?

(a) 50 A (b) 200 A
(c) 100 A (d) 500 A

UPPCL TG-2, 19.03.2021 Shift I

Ans : (d) Given,
Output power (P) = 100 kW or 100×10^3W
Output voltage (V) = 200V
Considering armature resistance as a negligible-

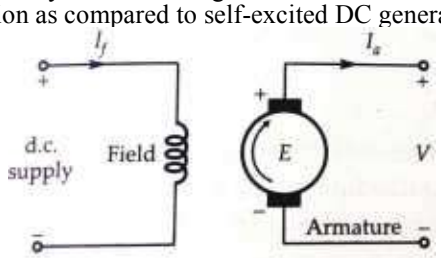
$$I = \frac{P}{V} = \frac{100\times10^3}{200}$$

I = 500A

114. In a separately excited DC generator, the prime mover is connected:
(a) In series with field winding
(b) with armature
(c) with field
(d) in parallel with supply voltage

UPPCL TG-2, 10.11.2023 Shift I
UPPCL TG-2, 19.03.2021 Shift I

Ans : (b) In a separately excited DC generator, the prime mover is connected with armature
■ Separately excited DC generator requires a separate DC source to excite the field winding.
■ Separately excited DC generator has better voltage regulation as compared to self-excited DC generator.



Separately excited d.c. generator

115. In a DC motor, if Faraday-Lenz relationship is applied to the triangular-shaped flux wave, it will result in:
(a) rectangular-shaped voltage wave
(b) DC voltage wave having no negative components
(c) clipped-sawtooth-shaped voltage wave
(d) triangular-shaped voltage wave

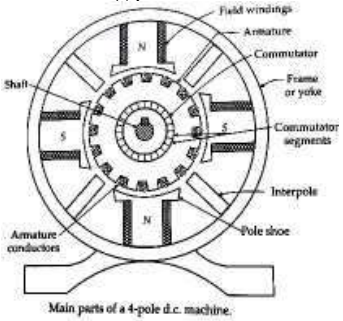
UPPCL TG-2, 19.03.2021 Shift I

Ans : (a) In a DC motor, if faraday-lenz relationship is applied to the triangular shaped flux wave, it will result in rectangular-shaped voltage wave

116. In which part of the DC machine is EMF induced?
(a) Commutator (b) Armature winding
(c) Yoke (d) Field winding

UPRVUNL TG-2, 17.07.2021 Shift I

Ans (b) : The DC machine is emf induced in armature winding.
■ Armature is a rotating part of a DC machine.



Main parts of a 4-pole d.c. machine.

117. The pole pitch is calculated by .....
(a) $\frac{\text{Total number of slots}}{\text{Total number of coils}}$
(b) $\frac{\text{Number of poles}}{\text{Total number of slots}}$
(c) $\frac{\text{Number of slots}}{\text{Total number of poles}}$
(d) $\frac{\text{Total number of coils}}{\text{Number of poles}}$

UPRVUNL TG-2, 17.07.2021 Shift I

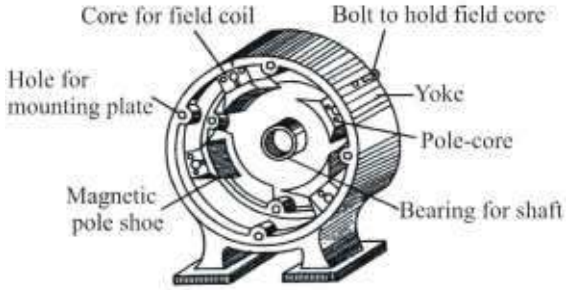
Ans (c) : The pole pitch is equal to the total number of armature slot divided by the number of pole in the machine
■ It is always 180° electrical.

$$\text{Pole Pitch} = \frac{\text{Number of armture slots}}{\text{Number of poles}}$$

118. The yoke of low strength DC machine is made of.....
(a) fabricated steel (b) cast iron
(c) brass (d) aluminium

UPPCL TG-2, 10.11.2023, Shift-I
UPRVUNL TG-2, 17.07.2021 Shift I

Ans (b) : The yoke of a low power DC machine is made of cast iron.
■ In case of large size machine it is made by cast steel and rolled steel.
■ The main function of the yoke in the machine is to offer mechanical support the main field pole as well as interpole.



Stator and main parts of DC machine

119. How are the inter-pole windings connected in a DC generator?
(a) In series with the armature and of opposite polarity ahead of the approaching pole
(b) In series with the armature and of the same polarity ahead of the approaching pole
(c) Parallel with the armature and of opposite polarity ahead of the approaching pole
(d) Parallel with the armature and of the same polarity ahead of the approaching pole

UPRVUNL TG-2, 17.07.2021 Shift I

Ans (b) : The inter-pole winding connected in a DC generator in series with the armature and of the same polarity ahead of the approaching pole.
■ Inter pole is a small pole
■ Placed in between the main field pole.
■ The number of inter pole is equal to main pole.

120. For a good generator, the value of commercial efficiency (n_e) may be .....

(a) 10%
(b) as high as 95%
(c) as low as possible 20%
(d) 20%

UPRVUNL TG-2, 17.07.2021 Shift I
JMRC Electrician (IOF-2014)

Ans (b) : For a good generator, the value of commercial efficiency (n_e) may be as high as 95%
■ Its efficiency is defined as the ratio of electrical power output to mechanical power input.

121. The armature of a DC generator has a 2-layer lap-winding placed in 72 slots with 6 conductor slots. What will be the minimum number of commutator bars required for the armature?

(a) 432 (b) 864
(c) 144 (d) 216

UPPCL TG-2, 20.03.2021 Shift II

Ans. (d) : Given
Total slots = 72
With 6 conductor/slots
Total conductor = 432
For, 2-layer lap winding, the minimum number of commutator bars is given by-

$$N = \frac{432}{2}$$

$$\boxed{N = 216}$$

122. Which of the following factors does not cause a decrease in the terminal voltage of a shunt generator ?

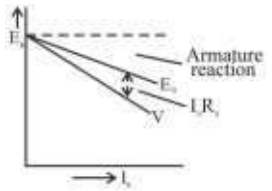
(a) Armature reaction
(b) Reduction in field current
(c) Armature reactance
(d) Armature resistance

UPPCL TG-2, 20.03.2021 Shift II

Ans. (c) : Armature reactance does not cause a decrease in the terminal voltage of a shunt generator.
■ The three factors which cause decrease in the terminal voltage of a shunt generator are-
(i) Armature reaction
(ii) Reduction in field current
(iii) Armature resistance.

$$\boxed{E_g = V + I_a R_a}$$

$$\boxed{V = E_g - I_a R_a}$$

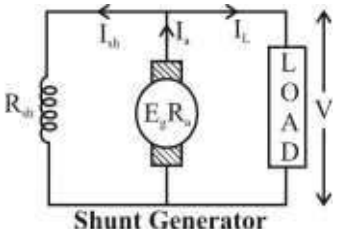


123. A 4-pole DC generator is delivering 20A to a load of 10Ω if the armature resistance is 0.5Ω and the shunt field resistance is 50Ω, then calculate the induced electro-motive force. Its brush drop is 1V per brush.

(a) 186 V (b) 210 V
(c) 200 V (d) 214 V

UPPCL TG-2, 20.03.2021 Shift II

Ans. (d) : Given that-
P = 4, I_L = 20 Amp, R_L = 10Ω, V = 20 × 10
= 200 volt



Shunt Generator

Solution

$$\boxed{I_a = I_{sh} + I_L}$$

$$= \frac{200}{50} + 20$$
$$= 4 + 20$$
$$I_a = 24 \text{ Amp}$$
$$E_g = V + I_a R_a + 2 \times 1$$
$$= 200 + 24 \times 0.5 + 2$$
$$= 200 + 12 + 2$$

$$\boxed{E_g = 214 \text{ Volt}}$$

124. Which of the following losses are not constant with respect to shunt and compound generator?

(a) Hysteresis losses
(b) Eddy current losses
(c) Field Cu losses
(d) Armature Cu losses

UPPCL TG-2, 20.03.2021 Shift II

Ans. (d) : In shunt and compound generators the armature copper losses are not constant. Because armature copper losses depend on the load current.
■ Those losses in a DC machine that remain constant at all loads are called constant losses. These losses include-iron losses, shunt field copper loss, and mechanical losses.
■ Iron losses and mechanical losses together are called stray losses.

125. A DC generator has 48 conductors and 4 poles. Calculate the pole pitch.

(a) 52 (b) 12
(c) 48 (d) 4

UPPCL TG-2, 20.03.2021 Shift II

Ans. (b) : Given,
Total number of conductors (Z) = 48
Number of pole (p) = 4

$$\text{Pole pitch } (Y_p) = \frac{\text{total number of conductors}}{\text{total number of poles}}$$

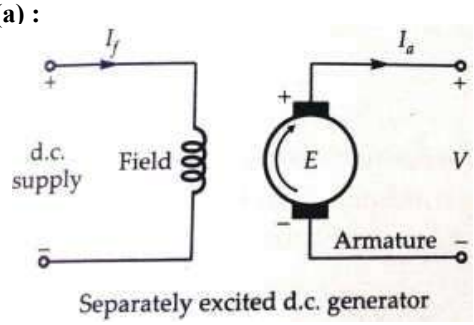
$$Y_p = \frac{48}{4} = 12$$

126. A 250V, 10kW separately excited generator has an induced emf of 255 V at full load. If the armature brush drop is 2V per brush calculate the resistance of the generator at a load current of 40A.

(a) 25 mΩ (b) 10 mΩ
(c) 15 mΩ (d) 20 mΩ

UPRVUNL TG-2, 15.07.2021 Shift I

Ans (a) :



Separately excited d.c. generator

Where, $E_g = 255$, $V = 250$, $I_L = 40$Amp.

$V = E_g - I_aR_a$

$V = E_g - I_aR_a$ – Brush drop

$250 = 255 - 40 \times R_a - 2 \times 2$

Since the number of brushes is 2.

$250 - 255 + 4 = -40R_a$

$-5 + 4 = -40R_a$

$$R_a = \frac{1}{40}$$

$\boxed{R_a = 25m\Omega}$

127. A 200V shunt generator delivers a line current of 20A. If armature resistance is 1Ω and field resistance 100Ω, then the efficiency will be _____.

(a) $\frac{4000}{4724}$ (b) $\frac{4400}{4884}$

(c) $\frac{4000}{4884}$ (d) $\frac{4400}{4724}$

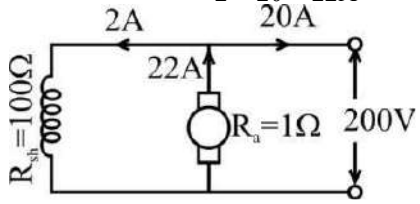
UPPCL TG-2, 20.03.2021 Shift I

Ans. (c) : $I_{sh} = \frac{V}{R_{sh}} = \frac{200}{100} = 2A$

$I_L = 20A$

$I_a = I_{sh} + I_L$

$= 2 + 20 = 22A$



$$\text{Efficiency} = \frac{\text{Output}}{\text{Output} + \text{losses}}$$

$$= \frac{VI_L}{VI_L + I_{sh}^2 \times R_{sh} + I_a^2R_a}$$

$$= \frac{200 \times 20}{200 \times 20 + (2)^2 \times 100 + (22)^2 \times 1}$$

$$= \frac{4000}{4884}$$

128. A shunt generator delivers 100A at 200V. Find the generated voltage if shunt field resistance and armature resistance are 50 Ω and 0.1 Ω respectively.

(a) 200 V (b) 210 V

(c) 209.6 V (d) 210.4 V

ISRO (VSSC) Technician (B) 14.07.2021, 4:30-6:30 PM

Ans. (d) : Given that-

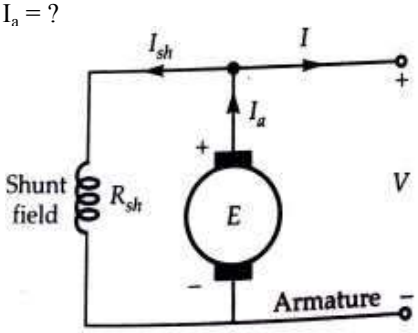
$I_L = 100A$

$V = 100V$

$R_f = 50\Omega$

$R_a = 0.1\Omega$

$I_a = ?$



Shunt wound d.c. generator

Formula-

$E_g = V + I_aR_a$

$I_a = I_L + I_{sh}$

$$= 100 + \frac{V}{R_f}$$

$$= 100 + \frac{200}{50}$$

$= 100 + 4$

$I_a = 104A$

$E_g = 200 + 104 \times 0.1$

$= 200 + 10.4$

$\boxed{E_g = 210.4V}$

129. Shunt generators are most suited for stable parallel operation because their voltage characteristics is

(a) Linear (b) Identical

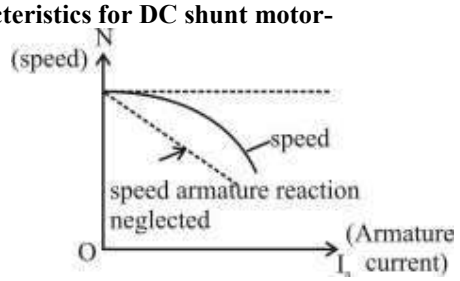
(c) Dropping (d) Rising

ISRO (VSSC) Technician (B) 14.07.2021, 4:30-6:30 PM

Ans. (c) : DC shunt generators are most suited for stable parallel operation because their voltage is dropping characteristics.

Shunt Generator- A shunt generator is a type of electric generator in which field winding and armature winding are connected in parallel and in which the armature supplies both the load current and the field current for the excitation.

Characteristics for DC shunt motor-



Uses- They are used for battery charging applications.

130. In a DC generator, which part will convert AC into DC?

(a) Commutator (b) Field

(c) Brush (d) Armature

ISRO IPSC Tech-B 22.04.2018

DSSB Craft Instructor Wireman- 01.09.2019

Ans. (a) : In a DC generator, commutator is the part which will convert AC into DC.
■ In a DC Motor, commutator will convert DC into AC
Commutator- It is also called split rings.
■ Commutator is made by hard drawn copper.
■ It is segmented form.
■ Each segment s insulated by mica.
■ Mica is harder than copper.
■ It is also called mechanical rectifier

131. Which liquid do you use for cleaning the commutator of a DC generator?
(a) Carbon tetra chloride
(b) Kerosene (c) Iodine
(d) Petrol mixed with oil

KPSC Electrician -30.09.2020

Ans. (a) : Carbon tetra chloride liquid use for cleaning the commutator of a DC Generator.
■ The carbon tetrachloride very useful for cleaning manufactured parts of different machines, specially the commutator of a DC generator.
■ Carbon tetrachloride dissolves other organic materials such as oil, fats and grease very well.

132. Silicon steel is used to reduce the losses of _____.
(a) eddy current (b) friction
(c) hysteresis (d) copper

DMRC Maintainer 20.02.2020 (9.00-10.30)

Ans. (c) Silicon steel is used to reduce hysteresis losses.
■ The amount of silicon in steel is very small amount.
■ Hysteresis losses can minimized by using material having least hysteresis loop area.
$W_h = \eta B_{max}^{1.6} fv$ Watt
Where,
η = steinmetz's constant
v = the volume of the core
f = supply frequency
B_m = magnetic flux density

133. In a DC generator, windage loss is proportional to:
(a) Square of the supply current
(b) Flux density
(c) Supply voltage
(d) Square of the armature speed

DMRC Maintainer 19.02.2020 (9.00-10.30)

Ans. (d) A Dc generator, windage loss is proportional to square of the armature speed.

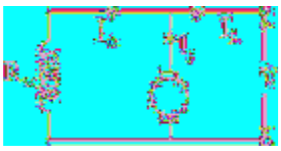
$$\text{windage loss} \propto N^2$$

Where N = Armature speed.
■ Winding losses occur due to the air inside the rotating coil of the machine.

134. A 4 pole DC shunt generator with lap connected armature has field and armature resistance of 50Ω and 0.1Ω respectively, if the generator supplies sixty 100V, 40W lamps, What will be the value of armature current?
(a) 2A (b) 26A
(c) 28A (d) 24A

DMRC Maintainer 18.02.2020 (9.00-10.30)

Ans (b) :



Given,
$R_{sh} = 50\ \Omega$
$R_a = 0.1\ \Omega$
Lamp Rating = 40 W, 100 V
No. of lamp = 60

Each lamp resistance $= \frac{V^2}{P} = \frac{100 \times 100}{40} = 250\Omega$
Each lamp in connected in parallel
Hence total resistance =

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ... + \frac{1}{R_{60}}$$

$$\frac{1}{R_{eq}} = \frac{1}{250} + \frac{1}{250} + ... + \frac{1}{250}$$

$$\frac{1}{R_{eq}} = \frac{60}{250}$$

$$R_{eq} = \frac{250}{60} = 4.16 \text{ ohm}$$

Then $I_L = \frac{V}{R_{eq}} = \frac{100}{4.16} = 24A$

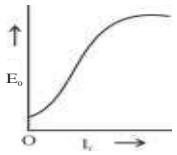
Current flowing through shunt $= \frac{V}{R_{sh}} = \frac{100}{50} = 2A$

Armature current $(I_a) = I_L + I_{sh}$
$= 24 + 2 = 26$ A

135. Pick the right way to refer to the no load saturation characteristics or magnetic characteristics or Open Circuit characteristics of a DC generator.
(a) E/I_a (b) E_0/I_f
(c) V/I (d) E/I

HSSC ALM 14.03.2020 Shift-II
Bihar TG-2, 03.10.2018 (Batch-4)

Ans. (b) : Open circuit characteristic is also known as magnetic characteristic or no-load saturation characteristic. This characteristic shows the relation between generated emf at No-load (E_0) and field current (I_f).



■ Internal characteristic shows the relation between generated emf at full load (E_g) and armature current (I_a).
■ External characteristic shows the relation between terminal voltage (V_t) and load current (I_L).

136. The effect of iron loss on DC generator is-
(a) Loss of efficiency (b) Loss of voltage
(c) Loss of current (d) Loss of iron

RSMSSB Instructor (Electrician) 24.03.2019

Ans. (a) : The effect of iron loss on DC generator is loss of efficiency.
■ Increasing losses reduce the efficiency of machine.

137. Keeping pole flux constant, if the speed of a DC shunt generator is doubled, then its generated emf-

(a) Will be doubled
(b) Will be halved
(c) Will remain unchanged
(d) Will decrease slightly

RSMSSB Instructor (Electrician) 24.03.2019
UPPCL ElectricianTG-2, 16.10.2016 (Re-exam)

Ans. (a) : The pole flux constant, if the speed of a DC shunt generator is doubled, then its generated emf will be doubled.

For DC shunt generator -

$$E_g \propto N \qquad \left\{\because E_g = \frac{P\phi ZN}{60A}\right\}$$

$$\{\because \phi = \text{constant}\}$$

According to question -

$$N_2 = 2N_1$$

$$\frac{E_{g_2}}{E_{g_1}} = \frac{N_2}{N_1}$$

$$\frac{E_{g_2}}{E_{g_1}} = \frac{2N_1}{N_1}$$

$$\boxed{E_{g_2} = 2E_{g_1}}$$

138. Inter poles in DC machines are used to

(a) Reduce the effect of armature reaction
(b) Reduce the effect of cogging
(c) Reduce the effect of crawling
(d) None of these

(ISRO DT. 02.06.2019)

Ans : (a) Inter poles in DC machines are used to reduce of armature reaction .
■ Inter pole is a small pole
■ Placed in between the main field pole.
■ It is connected in series with armature.
Hence the same current will flow in the inter pole winding but in opposite direction.

139. Which two main parts are generally there in any electrical machine?

(a) Carbon brush and rotor
(b) Main pole and inter pole
(c) Stator and rotor
(d) Commutator and inter pole

PGCIL Tech. 14.11.2018

Ans : (c) Two main parts are generally the stator and rotor in any electrical machine.
■ The rotor is the rotating part, and the stator is the stationary part of an electrical machine.

140. What is the rotating part of a DC machine called?

(a) Rotor (b) Field
(c) Armature (d) Stator

MP Line Attendant 23.07.2018

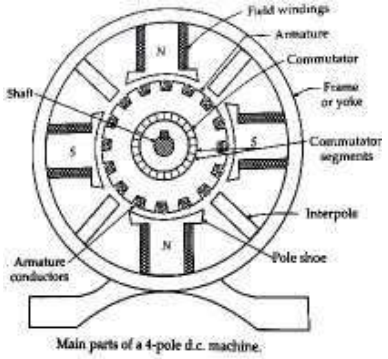
Ans : (c) The rotating part of a DC machine is called a armature.
■ Armature generally cylindrical drum type which is punched into slot. Which contain armature winding on it the slot provide mechanical security to the winding.
■ The armature is made up of silicon steel material.

141. What is a commutator used for?

(a) Transformer
(b) D.C machine
(c) Induction machine
(d) Synchronous machine

MP Line Attendant 24.07.2018
ISRO DT- 10.02.2019

Ans : (b) The commutator used for DC machine.
■ Commutator made by hard drown copper.
■ It is made in the segmented form.
■ Each segment is insulated with a thin layer of mica.
■ It is act as a mechanical rectifier.
■ It converts bidirectional signal into unidirectional signal.
■ The number of commutator segment is equal to number of coil in the armature.



Main parts of a 4-pole d.c. machine.

142. In resistance commutation _____ copper brushes are comparatively replaced by _____ carbon.

(a) High, High (b) Low, high
(c) Low, low (d) High, low

MP Line Attendant 23.07.2018

Ans : (b) In resistance commutation low copper brushes are comparatively replaced by high carbon brushes.

Advantage of carbon brushes:-
■ They have high contact resistance which is useful for having good commutation.
■ They uses as lubricate and polish the commutator as it rotates.
■ In the event of sparking, carbon brushes will damage the commutator less in carbon brushes comparison to copper brushes.

143. In which type of DC machine poles is residual magnetism necessary.

(a) Shunt generator
(b) Motor
(c) Separately excited generator
(d) Permanent magnet type generator

Haryana Shifting Assistant2016 Shift–I

Ans : (a) For DC shunt generator residual magnetism is necessary.
■ Residual magnetism is the small magnetic field left in the iron cores of shunt fields when the generator is rest. Without it, the field would have to be flashed with a DC current in order to start the generator generating.
Hence to start the generator, it is necessary for DC shunt generator.

144. To save energy during braking, which type of braking is used?

(a) Plugging
(b) Dynamic braking
(c) Regenerative braking
(d) Eddy current braking

MP Line Attendant 24.07.2018

Ans : (c) To save energy during braking, the regenerative braking is used.
■ In this braking method, no energy is drawn from the supply during the braking period and some of the energy is feedback to the supply system.

145. What is the effect of total flux reduction by the armature reaction called ?

(a) Magnetising effect
(b) Demagnetising effect
(c) Cross- magnetising effect
(d) Commutation

MP Line Attendant 23.08.2018

Ans : (b) The effect of total flux reduction by the armature reaction is called demagnetising effect.
■ In this process the armature flux demagnetizes or weakers the main flux.

146. A 4 pole D.C generator has a lap-wound armature with 50 slots with 16 conductors per slot. The useful flux per pole is 30 mWb. Determine the speed at which the machine must be driven to generate an emf of 240V.

(a) 450 rpm (b) 600 rpm
(c) 750 rpm (d) 300 rpm

Bihar TG -2, 03.11.2018, [Batch - 3]
Bihar TG -2, 27.11.2018, [Batch - 1]
Bihar TG -2, 04.11.2018, [Batch - 3]

Ans : (b) Given,

Pole = 4

Lap winding (A = P)

$Z = 16 \times 50$

$Z = 800$ conductor

$\phi = 30$ mWb $= 30 \times 10^{-3}$ Wb

$E_g = 240$ volt

speed N = ?

$$\boxed{E_g = \frac{\phi ZNP}{60A}}$$

$$N = \frac{E_g \times 60 \times A}{\phi \times Z \times P}$$

$$N = \frac{240 \times 60 \times 4}{30 \times 10^{-3} \times 800 \times 4} = \frac{14400}{24}.$$

$$\boxed{N = 600 \text{ r.p.m}}$$

147. What type of generator should be used for an electric booster-

(a) Commulative compound
(b) Differential compound
(c) Shunt
(d) Series

UPPCL TG-2 (Date : 24-01-2019) Shift-I
UPPCL TG-2, 11.11.2016
Noida Metro Technician Grade-II, 2017

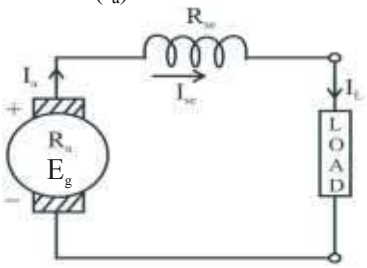
Ans : (d) Series generator should be used for an electric booster.
■ Used as boosters to compensate the voltage drop in the feeder in various types of distribution system such as railway service.
■ Differential compound generator is used in electric arc welding.
■ Shunt generator is used in battery charging power supply.
■ Separately excited generator is used in ward Leonard method of speed control
■ Cumulative compound generator is used in DC distribution system of power supply system for light fans used as power source.

148. In a series motor, the load current (I_L) is _____ .

(a) $I_a = I_{se}$ (b) $I_a \times I_{se}$
(c) $I_a - I_{se}$ (d) $I_a + I_{se}$

UPPCL TG-2 (Date : 24-01-2019) Shift-II
KPSC Lineman- 19.12.2021

Ans : (a) In a series motor, the load current (I_L) is equal to armature current (I_a) and series field current (I_{se}).



$$\boxed{I_a = I_{se} = I_L}$$

■ Series generator used as booster in distribution system.

149. The emf produced in a direct current generator is proportional to _____ .

(a) Number of passive coils
(b) Pole flux
(c) Field current
(d) Number of armature parallel paths.

UPPCL TG-2 (Date : 25-01-2019) Shift-I

Ans : (b) The Emf produced in a direct current generator emf is given as $(E_g) = \frac{ZP\phi N}{60A}$

Where-

Z = Conductor per pole
P = The number of poles
ϕ = The flux per pole
N = The speed in rpm
A = The number of parallel paths.

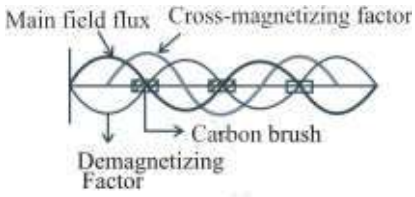
150. The primary reason for providing compensating winding in a DC generator is -

(a) To neutralize the cross-magnetizing flux
(b) To maintain the distribution of uniform flux.
(c) To compensate for the decreasing main flux
(d) To neutralize the armature mmf

UPPCL TG-2 (Date : 25-01-2019) Shift-I

Ans : (a) The primary reason for providing compensating winding in a DC generator is to neutralize the cross-magnetizing flux.

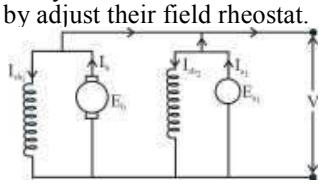
■ The compensating winding is placed in the pole - shoe, it is connected in series with, the armature but the direction of current is kept opposite to it.



151. What is the simplest way to transfer the load from one DC shunt generator running parallel to another?
(a) Adjust the speed of the prime mover
(b) Insert a resistance in the armature circuit
(c) Adjust their field rheostat
(d) Use an equalizer connection

UPPCL TG-2 (Date : 25-01-2019) Shift-I

Ans : (c) When two generator are operating in parallel, the load may be shifted from one shunt generator to another by adjust their field rheostat.



152. In a DC generator armature reaction is produced by-
(a) Armature conductor
(b) Its field pole coil
(c) Armature current
(d) Field pole coil

UPPCL TG-2 (Date : 25-01-2019) Shift-I

Ans : (c) In a DC generator armature reaction is produced by armature current or load current.

Armature reaction has two components -

(i) Cross - magnetizing

(ii) Demagnetizing

Armature reaction in DC generator - Armature reaction is a phenomenon that occurs in DC generator due to the interaction of armature flux with the main field flux. this interaction leads to a change in the distribution of the magnetic field in the air gap which affect the performance of the generator.

The armature reaction can be either demagnetizing or cross-magnetizing, depending on the direction of the armature current or load current.

$$AT_C = ZI\left(\frac{1}{2P} - \frac{\theta_m}{360^o}\right)$$

$$AT_d = ZI\left(\frac{\theta_m}{360^o}\right)$$

153. What is the most likely cause of sparking on the brushes in a direct current (DC) machine?
(a) Wrong brush-spring position
(b) Open coil, inter-pole and wrong brush-spring position in armature
(c) Open coil in armature
(d) Bad inter pole

UPPCL TG-2 (Date : 25-01-2019) Shift-I

Ans : (b) The main causes of sparking on brushes can be open coil in the armature, inter-poles and wrong brush-spring position in armature.

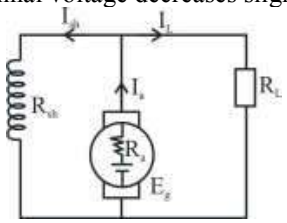
Brushes in DC machines are usually made of carbon which reduces sparking.

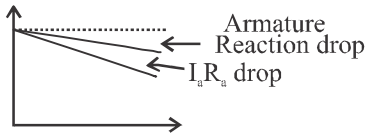
■ In a DC machine brushes are installed on the commutator.

154. What is the main drawback of a DC shunt generator?
(a) Generated voltage is low
(b) The terminal voltage decreases slightly with load
(c) It is expensive
(d) Shunt field circuit has high resistance

UPPCL TG-2 (Date : 25-01-2019) Shift-II

Ans : (b) The main drawback of a D.C shunt generator is that the terminal voltage decreases slightly with load.





■ It is clear that characteristics the terminal voltage decrease as the load increase.

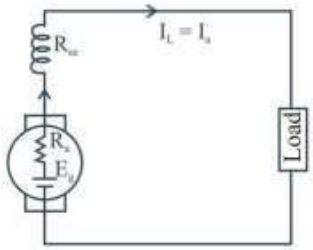
■ Shunt generator is used in battery charging power supply.

155. Series field winding of a DC machine consists of.
(a) Many turns of thick wire
(b) Many turns of thin wire
(c) Few turns of thick wire
(d) Few turns of thin wire

UPPCL TG-2 (Date : 25-01-2019) Shift-II

Ans : (c) Series field winding of a DC machine consist of few turn of thick wire.

■ Series field winding has a low resistance is connected in series with the armature.



156. A DC shunt generator, having a terminal voltage of 250V, is delivering 195 A to load. Its armature and field winding resistance are 0.02Ω and 50Ω respectively. What will be the value of generated emf ?
(a) 282 V (b) 270 V
(c) 254 V (d) 246 V

UPPCL TG-2 (Date : 25-01-2019) Shift-II

Ans : (c) Given,

$V = 250\ V,\ I_L = 195$ Ampere

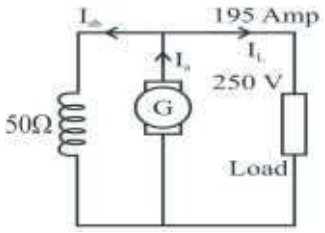
$R_a = 0.02\ \Omega,\ R_{sh} = 50\ \Omega \quad E_g = ?$

$$I_{sh} = \frac{250}{50} = 5A$$

$I_a = I_{sh} + I_L = 5 + 195 = 200$ A

$E_g = V + I_a . R_a$

$E_g = 250 + 200 \times 0.02 = 250 + 4 = 254$ V



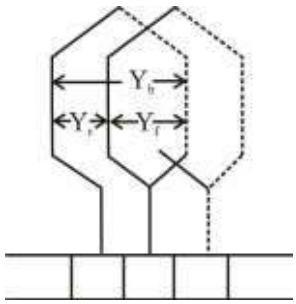
157. What is the number of elements spanned by a coil on the armature conductor or lead is called?

(a) Front pitch
(b) Commutator pitch
(c) Resultant pitch
(d) Back pitch

UPPCL TG-2 (Date : 25-01-2019) Shift-II

Ans : (a) The number of armature conductors or elements spanned by a coil on the front is called front pitch.

■ Alternatively, we define the front pitch as the distance between the second conductor of the next coil which connects the front i.e., the commutator end of the armature.



Where,

Y_b= back pitch
Y_f = front pitch
Y_r= Resultant pitch

158. The self-induced emf in the coil undergoing commutation is called the.

(a) Back emf
(b) Dynamically induced emf
(c) Reactance voltage
(d) Emf per parallel path

UPPCL TG-2 (Date : 25-01-2019) Shift-II

Ans : (c) The self-induced emf in the coil undergoing commutation is called reactance voltage.

■ Reversal of coil current from ($+I_C$ to $-I_C$) with the help of commutator and brushes is called commutation.

■ For sinusoidal commutation reactance voltage is

$$V_r = 1.11L\frac{2.I_C}{T_C}$$

T_C = commutation period

■ For linear commutation reactance voltage is

$$V_r = L\frac{2I_c}{T_c}$$

159. Calculate the generated emf by a 10 pole wave wound generator having 100 slots and with 10 conductors per slot when driven at 1200 rpm. The flux per pole is 0.01 Wb.

(a) 100 V (b) 1000 V
(c) 1200V (d) 600V

(ISRO DT. 02.06.2019)

Ans : (b) $Z = 100 \times 10 = 1000$

$P = 10,\ N = 1200,\ \phi = 0.01$Wb

$A = 2$

$$E_g = \frac{P\phi ZN}{60A} = \frac{10 \times 0.01 \times 1200 \times 1000}{60 \times 2}$$

$E_g = 1000$ volt

160. Which of the following is a loss in a d.c. generator

(a) Copper loss (b) Iron loss
(c) Mechanical loss (d) All of the above

(ISRO DT. 02.06.2019)

Ans : (d) The D.C generator has the following losses:-

■ Iron loss, mechanical loss and copper loss.

Losses in a rotating DC machine-

(1) Copper losses-
(i) Armature copper loss
(ii) Field copper loss
(iii) Loss due to brush contact resistance loss.

(2) Iron loss-
(i) Hysteresis loss
(ii) Eddy current loss

(3) Mechanical losses-
(i) friction loss
(ii) windage loss

(4) Stay losses-
Stay losses = mechanical losses +iron losses

161. The open circuit characteristic of a DC generator is also called its ..... characteristics

(a) Magnetic (b) Internal
(c) External (d) None of these

(ISRO DT. 02.06.2019)

Ans : (a) The open circuit characteristic of a DC generator is also called its magnetic characteristics.

■ Open circuit characteristic is also known as magnetic characteristic or no load saturation characteristic (E_o/I_f)

■ This characteristic shows the relation between generated emf at no load (E_o) and the field current (I_F) at a given fixed speed.

■ An internal characteristics curve shows the relation between the on-load generated emf (E_g) and the armature current (I_a).

■ An external characteristics curve show the relation between the terminal voltage (V_t) and load current (I_L).

162. In a DC generator armature reaction is produced by both field and armature current.

(a) Armature current

(b) Field current
(c) Both field and armature current
(d) Either field or armature current

(ISRO DT. 02.06.2019)

Ans : (c) In a DC generator armature reaction is produced by both field and armature current.
Armature reaction : The effect of armature flux (mmf) on the main field flux (mmf) is called armature reaction.
■ **There are two effect of armature reaction -**
(i) Demagnetising effect
(ii) Cross-magnetising effect

163. A four-pole generator, having wave-wound armature winding, has 51 slots, each slot containing 20 conductors. What will be the voltage generated in the machine when driven at 1500 rpm, assuming the flux per pole to be 7.0 mWb?
(a) 278.5 V (b) 188.5 V
(c) 168.5 V (d) 178.5 V

[LMRC Maintainer 12.05.2018, Shift–II]

Ans. (*) : Given,
flux (ϕ) = 7×10^{-3} Wb
Total conductor (Z) = $51 \times 20 = 1020$
Rotor Speed (N) = 1500 r.p.m.
Pole (P) = 4
Generated e.m.f. (E_g) = ?
Number of Parallel Path (A) = 2
Solved-
Formula –

$$\boxed{E_g = \frac{\phi ZNP}{60A}}$$

$$E_g = \frac{7\times10^{-3}\times1020\times1500\times4}{60\times2}$$

E_g = 357 volt
Note:- The commission has considered option (d) is correct.

164. The resistance offered between the brushes and commutator for current flow is called _____ .
(a) Specific resistance of brush material
(b) Brush contact resistance
(c) Brush friction resistance
(d) Brush resistance

[LMRC Maintainer 12.05.2018, Shift–II]

Ans. (b) : The resistance offered between the brushes and commutator for current flow is called brush contact resistance.
■ The function of the brushes is to collect the electric current from the commutator and send into the external working circuit.

165. Which of these is not a part of DC machine?
(a) Armature
(b) Commutator
(c) Tap changer
(d) Brush

[NMRC Maintainer 14.09.2019]

Ans : (c) Tap changer is not a part of D.C machine.
■ **Important parts of the DC Machine-**
Stator, rotor, mainpole, inter pole, base plate terminal box, shaft commutator, bearing, bearing plate, brush holder, brush rocker armature winding. etc

166. A generator is rated 2 kW, 200V DC it can supply load current of -
(a) 2 Ampere (b) 4 Ampere
(c) 10 Ampere (d) 20 Ampere

[LMRC Maintainer 12.05.2018, Shift–II]

Ans : (c) Power = 2 KW
Voltage (V) = 200V
$\therefore \boxed{P = VI}$
I_L = Load current

$$\therefore I_L = \frac{P}{V} = \frac{2\times1000}{200} = 10A$$

$$\boxed{I_L = 10A}$$

167. What is used to achieve sparkless commutation?
(a) Compensating Winding
(b) Inter-pole
(c) Compensating winding and copper brushes
(d) Copper, brushes

DMRC Maintainer- 09.04.2018, 9:00-10:00
GSSB Instructor Grade- B, 30.12.2016

Ans : (b) To achieve sparkless commutation interpole is placed between the main poles.
■ It is connected in series with armature hence the same current will flow in the inter-pole winding but in opposite direction.
■ Number of inter-pole is equal to main pole.
■ Inter-pole will reduces the cross-magnetizing effect of armature reaction.
■ And sparking will reduces at commutator surface.

168. The series and shunt fields produce the flux that acts in same direction as in:
(a) Induction motor
(b) DC generator
(c) Cumulative compound generator
(d) DC motor

[DMRC Maintainer 09.04.2018, 9.00 -10:30 am]

Ans : (c) The series and shunt field produce the flux that act in same direction as in cumulative compound generator.
■ Cumulative compound generator are generally used for lighting power supply purpose.

169. The effect of armature reaction it to shift the magnetic neutral axis towards.
(a) Direction of rotation for generator
(b) Same direction
(c) Direction of magnetic field
(d) Opposite direction

[DMRC Maintainer 09.04.2018, 9.00 -10:30 am]

Ans : (a) The effect of armature reaction is to shift the magnetic neutral axis towards direction of rotation for generator.

170. When the armature of the motor rotates in a magnetic field it intersects the magnetic lines of force and then-
(a) Current is induced
(b) Motor stops
(c) Electromotive force is induced (Emf)
(d) Resists electromotive force (Emf)

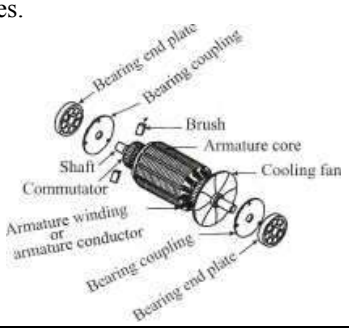
[DMRC Maintainer 09.04.2018, 9.00 -10:30 am]

Ans : **(c)** When the armature of the motor rotates in a magnetic field it intersects the magnetic line of force and then according to faraday's law an electromotive force (emf) is induced.
It's mathematical expression is-

$$E = -N\frac{d\phi}{dt}$$

171. The thickness of lamination in the armature core of the generator is _____ .
(a) 0.45 mm to 0.5 mm (b) 0.35 mm to 0.5 mm
(c) 0.35 mm to 0.4 mm (d) 0.25 mm to 0.4 mm
[DMRC Maintainer 10.04.2018, 9.00 -10:30 am]
KPSC Lineman Exam- 21.04.2016
JVVNL Electrician Helper-III, 29.08.2018 Shift-I

Ans. (b) : The thickness of lamination in the armature core of the generator is 0.35 mm to 0.5 mm.
■ In a DC machine, lamination are used to reduce eddy current losses.



172. Armature reaction is defined as the effect of the magnetic field established by the armature on _____ .
(a) Commutator (b) Main field flux
(c) Interpole (d) Armature coil
[DMRC Maintainer 11.04.2018]

Ans. (b) : Armature reaction is defined as the effect of the magnetic field established by the armature on the main field flux.
The effect of armature flux on the main flux is called armature reaction.

173. A short circuit occurs between the armature coils during commutation, when_____ .
(a) Any two commutators come in contact with the yoke
(b) Any two commutators come in contact with rotor
(c) Any two commutators come in contact with brushes
(d) Any two commutators come in contact with the armature core
[DMRC Maintainer 12.04.2018, 9.00 -10:30 am]

Ans. (c) : A short circuit occurs between the armature coil during commutation when any two commutators come in contact with brushes.

174. What does the armature core provide ?
(a) Magnetic flux produces capacitance
(b) Inductance of magnetic flux
(c) Creates reluctance in magnetic flux
(d) Creates resistance in magnetic flux
[DMRC Maintainer 12.04.2018, 9.00 -10:30 am]

Ans. (c) : The armature core provide reluctance in magnetic flux
■ Armature core is made of silicon steel lamination which are insulated from each other by insulated varnish coating.

175. In armature reaction the brushes are placed exactly on the magnetic neutral axis to_____ .
(a) To reduce armature reaction
(b) To maximize the armature reaction
(c) To stop the flow of current
(d) Increase in sparking
[DMRC Maintainer 12.04.2018, 9.00 -10:30 am]

Ans. (a) : In armature reaction the brushes are placed exactly on the magnetic neutral axis to reduce armature reaction.
MNA (Magnetic neutral axis) - May be defined as the axis along which no Emf is generated in the armature conductors as the move parallel to the flux lines. Brushes are always placed along the MNA because reversal of current in the armature conductors takes placed along this axis.

176. The starting and ending end of the coil connected to adjacent regions of a commutator are known as _____ .
(a) Retrogressive winding
(b) Lap winding
(c) Progressive winding
(d) Wave winding
[DMRC Maintainer 13.04.2018, 9 -10:30 am]

Ans. (b) : The starting and ending end of the coil connected to adjacent region of commutator are known as lap winding.
■ Lap winding is suitable for low voltage and high current generator.
■ Lap winding the number of parallel path is equal to the total number of poles of the coil.
■ In lap winding, the number of brushes is equal to the number of parallel path.

177. In inter-pole method, inter-pole is placed between the main poles so that-
(a) Sparking can be reduced
(b) Voltage can be increased
(c) Sparking can be maximum
(d) The flow of current can increase
[DMRC Maintainer 13.04.2018, 9 -10:30 am]

Ans. (a) : In inter-pole method, inter-pole is placed between the main poles so that sparking can be reduced.
■ Inter-pole is connected in series with armature.
■ The winding of the inter-pole is made of thick wire and few turn
■ The number of inter-poles is equal to the number of main field poles.

178. To achieve DC generator are run in parallel operation.
(a) Low reliability (b) Low capacity
(c) Low value of load (d) High reliability
[DMRC Maintainer 13.04.2018, 9 -10:30 am]

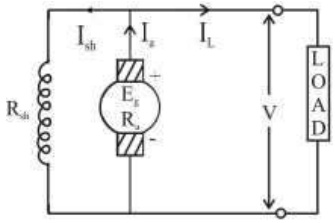
Ans. (d) : To achieve high reliability DC generator are run in parallel operation. So that fault occurs in any generator, then other generators installed in its place keep providing supply and there is no interruption in any kind of work, hence more than one generator is operated in parallel. Due to which the reliability of the system increase.

179. DC shunt generator is also called _____.

(a) Constant voltage DC generator
(b) DC series generator
(c) Constant current generator
(d) Variable voltage generator

[DMRC Maintainer 17.04.2018, 9.00 -10:30 am]
ISRO Ahmedabad Tech. 29.04.2018

Ans. (a) : DC shunt generator is also called. constant voltage DC generator. Because the value of flux in a DC shunt generator is almost constant.



D.C. Shunt Generator

$$E_g = V + I_a R_a$$

$$I_a = I_L + I_{sh}$$

180. The loss caused due to resistance of armature coil is called.

(a) Field loss
(b) Brush contact resistance loss
(c) Armature loss
(d) Iron loss

DMRC Maintainer 17.04.2018, 9.00 -10:30 am
MPPKVVCL Line Attendant 26.08.2017

Ans. (c) : The loss caused due to resistance of armature coil is called armature loss.

Armature loss $= I_a^2 R_a$

Where,

I_a = Armature current
R_a = Armature resistance

■ Armature is a rotating parts in the DC machine, which is made by laminated silicon steel.
■ The armature core are laminated to reduce eddy current losses.
■ The thickness of lamination from 0.35 to 0.5 mm.

181. _____ are included in mechanical losses.

(a) Mechanical loss on brush
(b) Friction loss at the pole
(c) Friction loss in the field
(d) No friction losses in bearing and commutator

[DMRC Maintainer 17.04.2018, 9.00 -10:30 am]

Ans. (a) : Friction loss on brush are included in mechanical losses.

■ **The following losses occur in DC machines-**
1. Iron loss
2. Copper loss
3. Mechanical loss
(i) friction loss
(ii) Windage loss

182. A simple common method to test armature winding for short and open coils is by a/an

(a) growler (b) ohmmeter
(c) multi meter (d) ammeter

Bihar TG -2, 04.11.2018, [Batch - 2]

Ans. (a) : A simple common method to test armature winding for short and open coils is by an growler.
■ Ohmmeter is used to measure resistance.
■ Multimeter is used to measure current, resistance and voltage.
■ Ammeter is used to measure current.

183. For an 8 poles armature winding having 128 slots, a coil spanning over 15 teeth is said to be

(a) short chorded by one slot pitch
(b) over chorded by one slot pitch
(c) short chorded by two slot pitch
(d) over pitched by two slot pitch

Bihar TG -2, 04.11.2018, [Batch - 2]
Bihar TG -2, 28.11.2018, [Batch - 2]

Ans. (a) : Given that, Pole (P) = 8
Number of slot = 128
Teeth = 15

$$\therefore \quad \text{pole pitch} = \frac{\text{Total no. of slots}}{\text{Total no. of poles}}$$

$$\text{Pole pitch} = \frac{128}{8} = 16$$

$\because$ Pole Pitch = 16
If the coil span is less than the pole pitch, coil is called short pitch.
Here, pole pitch = 16 and teeth = 15
For an 8 poles armature winding having 128 slots, a coil spanning over 15 teeth is said to be short chorded by one slot pitch.

184. The nature of input in DC generator is?

(a) electrical power (b) thermal power
(c) mechanical power (d) solar power

Bihar TG -2, 04.11.2018, [Batch - 3]
Bihar TG -2, 04.11.2018, [Batch - 1]

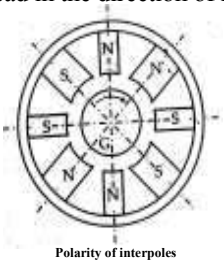
Ans. (c) : The nature of input in DC generator is mechanical power.
■ The mechanical power is given to the generator from the prime mover and the D.C generator converts this mechanical power into electrical power.

185. In a D.C generator, the polarity of an interpole relative to that of a main pole?

(a) is opposite to that of the next main pole in the direction of rotation
(b) is same as the polarity of the main pole behind it, considering the direction of rotation
(c) is same as the polarity of next main pole ahead in the direction of rotation
(d) can be of any polarity

Bihar TG -2, 03.11.2018, [Batch - 1]
IOF -2013
RRB Mumbai ALP -2005

Ans. (c) : In a D.C. generator, the polarity of an interpole relative to that of a main pole is same as the polarity of next main pole ahead in the direction of rotation.



Polarity of interpoles

186. A motor armature conductor of length 0.75 m is exposed to a flux density of 4 Wb/m^2 generated by the field winding. Calculate the force experienced by the conductor, when the armature electric current is 5 A?

(a) 5 N (b) 10 N (c) 15 N (d) 20 N

Bihar TG -2, 27.11.2018, [Batch - 1]

Ans. (c) Given that,

Length of conductor (ℓ) = 0.75m

Magnetic flux density (B) = 4 Wb/m^2

Electric current (I) = 5A

Formula -

$F = IBl \sin\theta = 5 \times 4 \times 0.75 \text{ Sin } 90^\circ = 5 \times 4 \times 0.75 \times 1$

F = 15 Neuton

187. Eddy current losses occur in which part of the DC Machine?

(a) Brush (b) Commutator

(c) Armature (d) Field

ALP, Technician 22.01.2019, [12:30-03:00]

Ans. (c) : Eddy current losses occur in armature part of the DC machine.

■ Armature is the rotating part of the DC machine.

■ The laminations are insulated from each other and tightly clamped together.

■ In small machines the laminations are keyed directly to the shaft.

■The purpose of using laminations is to reduce eddy current loss.

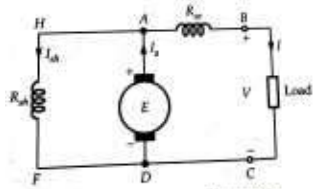
188. Short _____ Compound Generator is a type of DC generator:

(a) Series (b) Negative

(c) Shunt (d) Permanent

ALP, Technician 22.01.2019, [08:30-11:00]

Ans. (c) : Short shunt compound generator is a type of DC generator.



Short-shunt compound generator.

■ The shunt field is connected in parallel with the armature alone the machine is called the short shunt compound machine.

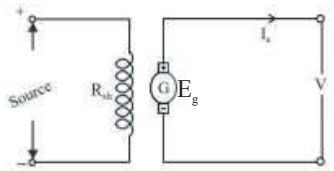
189. In Separately Excited Generator, the field windings are connected in:

(a) Shunt with source (b) close circuixc

(c) open circuit (d) Series with source

ALP, Technician 22.01.2019, [08:30-11:00]

Ans. (d) : In separately excited generator, the field windings are connected in series with source.



■ In separately excited D.C. generator, the field coils are energized by a separate D.C. Source.

190. If series winding is connected in series with the armature and then the shunt winding is put in parallel to the combination, then such a combination will form which kind of a generator?

(a) Short Shunt Compound Generator

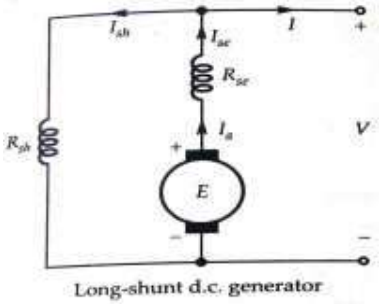
(b) Long Shunt Compound Generator

(c) Long Closed Compound Generator

(d) Long Series Compound Generator

ALP, Technician 22.01.2019, [04:30-07:00]

Ans. (b) : If series winding is connected in series with the armature and then shunt winding is put in parallel to the combination, then such a combination will form long shunt compound generator.



Long-shunt d.c. generator

191. A DC generator works on the principle of:

(a) Thermal Electric Field

(b) Magnetic Field

(c) Electro Magnetic Field

(d) Electro Magnetic Induction

ALP, Technician 22.01.2019, [04:30-07:00]

Ans. (d) : A D.C. Generator works on the principle of electro magnetic induction.

■ The working principle is based on the Fleming's right hand rule.

■ An electrical generator is a machine which converts mechanical energy (or power) into electrical energy (or power).

■ The energy conversion is based on the principle of the production of dynamically or (motionally) induced emf.

■ Whenever a conductor cuts magnetic flux, dynamically induced emf. is produced in it according to Faraday's Laws of Electro magnetic Induction.

192. Which part of a DC machine requires frequent maintenance?

(a) Rotor of DC machine

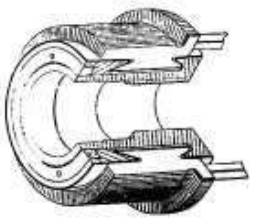
(b) Brush and commutator

(c) Supply connection

(d) Stator of DC machine

ALP, Technician 23.01.2019, [12:30-03:00]

Ans. (b) : Commutator and brush part of a D.C. machine requires frequent maintenance as they get damaged due to D.C. generator sparking, wear and tear etc.



Commutator

193. For a motor to work as a generator.

(a) The rotor must spun faster than its stator's asynchronous speed
(b) The rotor must spun faster than it stator's synchronous speed
(c) The rotor should spun very fast in clockwise direction
(d) The rotor should spun very fast in anti clockwise direction

ALP, Technician 23.01.2019, [12:30-03:00]

Ans. (b) : For a motor to work as a generator, the rotor must spun faster than its stator's synchronous speed.

194. In a D.C. generator, the number of poles and the number of armature conductors are fixed. Which of the following windings will give a higher EMF ?

(a) Lap winding
(b) Depents on other features of the design
(c) Wave winding
(d) Both lap winding and wave winding

ALP, Technician 23.01.2019, [08:30-11:00]

Ans. (c) : In a D.C. generator the number of poles and the number of conductors are fixed then the wave winding will give a higher EMF.
■ In general, the wave winding is used in high voltage, low current machine, and lap winding is used in law voltage, high current machine.

195. Armature reaction of an unsaturated D.C. machine results in effect.

(a) Demagnetising
(b) Axial magnetising
(c) Cross-Magnetising
(d) Two pole magnetizing

ALP, Technician 23.01.2019, [08:30-11:00]

Ans. (c) : Armature reaction of an unsaturated DC. machine result the effect is cross-magnetizing effect.
■ Armature reaction is the effect of magnetic flux set up by armature current upon the distribution of flux under the main poles.

196. The efficiency of a machine will be high if–

(a) input power is low
(b) losses are low
(c) true component of power is low
(d) kWh consumed is low

(UPPCL Electrician TG-2 Trainee 16.10.2016, Re-Exam)

Ans : (b) The efficiency of a machine will be high if losses are low.

$$\text{Efficiency} = \frac{\text{Output}}{\text{Input}}$$

$$= \frac{\text{Input} - \text{losses}}{\text{Input}} \quad \{\because \text{Output} = \text{Input} - \text{Losses}\}$$

197. In DC machine?

(a) The current and emf in armature conductors are alternating while those at the terminals are unidirectional
(b) The current and emf in armature conductor are unidirectional while those at the terminals are alternating
(c) The current and emf in armature conductor and at the terminal in directional
(d) The emf in armature conductors and at the terminals is alternating while current these is unidirectional

(DMRC Maintainer Electrical-2014)
MP Line Attendant (24-07-2018)

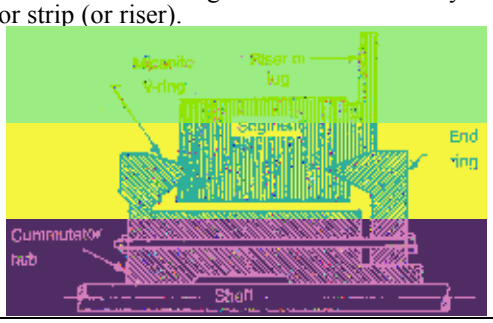
Ans : (a) In D.C. machine the current and emf in armature conductors are alternating while those at the terminals are unidirectional.
■ The currents induced in the armature conductor of D.C generator are alternating in nature. By commutation process it change from a generated alternating current to in unidirectional direct current.

198. How does the commutator of a DC machine work?

(a) Like as full wave rectifier
(b) Like as half wave rectifier
(c) Like as controlled full wave rectifier
(d) Like as controlled half wave rectifier

(DMRC Maintainer Electrical-2014)

Ans : (a) The commutator of a DC machine work like as a full wave rectifier. In DC machine use of commutator is to convert AC into DC.
Commutator-
■ It rectified i.e. converts the alternating current induced in the armature conductors into unidirectional current in the external load circuit.
■ These segments are insulated from each other by thin layers of mica.
■ The number of segments is equal to the number of armature coils.
■ Each commutator segment is connected by copper lugs or strip (or riser).



199. What is the shape of stator ?

(a) Rectangular (b) Ring-shaped
(c) Square (d) Triangular

(LMRC Maintainer Electrical Exam 2016)

Ans : (b) The shape of stator is ring shaped.
■ The stator of the machine does not move and normally is the outer part of the machine.
■ Stator and rotor are made of ferromagnetic materials.

200. In DC machines fractional pitch winding is used–

(a) to improve cooling
(b) to reduce copper losses
(c) to increase the generated emf
(d) to reduce the sparking

(LMRC Maintainer Electrical Exam 2016)

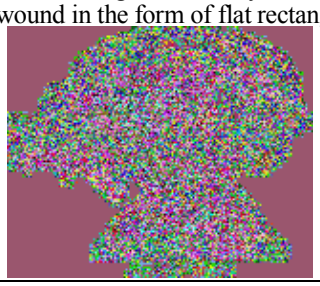
Ans : (d) In DC. machines fractional pitch winding is used to reduce the sparking.
Advantage of fractional pitch winding
■ It reduces the sparking
■ It reduces the amount of copper
■ It improves the wave form

201. In dc machines the plane passing through the axis of the armature and through center of contact of the brushes is known as:
(a) Geographic plane (b) Magnetic plane
(c) Commutating plane (d) Geometrical plane
(DMRC Maintainer Electrician 2017)

Ans : (c) In D.C machines the plane passing through the axis of the armature and through center of contact of the brushes is known as commutating plane.

202. In an armature, winding is connected in
(a) Parallel
(b) Series
(c) Either series or parallel
(d) Cannot be determined
(UPRVUNL-TG-2 Electrical-2015)

Ans : (c) In an armature, winding is connected in either series or parallel.
■ The armature windings are usually former-wound.
■ These are wound in the form of flat rectangular coils.



203. In a dc machine if P is the number of poles, N is the armature speed in rpm, then the frequency of the magnetic reversals will be
(a) PN/60 (b) PN/120
(c) PN/100 (d) PN/180
(UPPCL-TG2-Electrical-2015)

Ans : (b) Given that, Frequency = f
Number of poles = P
Speed in R.P.M. = N
$$\text{Frequency (f)} = \frac{PN}{120}$$

204. Iron loss in a dc machine takes place in
(a) yoke (b) commutator
(c) main body (d) armature rotor
(UPPCL-TG2-Electrical-2015)

Ans : (d) Iron loss in a DC machine takes place in armature rotor.
■ Iron losses are two types -
(i) Hysteresis loss (W_h) = $K_h B_m^{1.6} f V$ watt
(ii) Eddy current loss (W_e) = $K_e B_m^2 f^2 t^2 V$ watt
Where,
B_m = Maximum flux density (Wb/m^2)
f = Frequency of supply (Hz)
V = Volume of the material (M^3)
t = Thickness of lamination (m)
K_h = Coefficient of hysteresis
K_e = Eddy current constant

205. The winding used in a dc machine is/are
(a) lap winding only
(b) wave winding only
(c) both lap and wave windings
(d) concentric winding
(UPPCL-TG2-Electrical-2015)

Ans : (c) The winding used in a DC machine are both lap and wave windings.
■ Wave winding used in DC machine, for high voltage and low current.
■ Lap winding used in DC machine, for high current and low voltage.

206. Which of the following is not the effect of armature reaction in a dc machine?
(a) It weakens the main field flux and distorts it
(b) It produces heavy sparking on the commutator
(c) It weakens the emf generated in case of generator
(d) It increases the speed of the motor
(UPPCL-TG2-Electrical-2015)

Ans : (d) It increase the speed of the motor is not the effect of armature reaction in a D.C machine.
The effect of Armature reaction-
(i) It weakens the main field flux and distorts it
(ii) It produces heavy sparking on the commutator
(iii) It weakens the emf generated in case of generator
■ **Demagnetizing effect-** The armature flux demagnetizes the main flux.
■ **Cross magnetizing effect -** The armature reduces the main flux.

207. The winding of a dc machine is said to be full pitched winding when
(a) Winding pitch = pole pitch
(b) Winding pitch > pole pitch
(c) Winding pitch < pole pitch
(d) There is no relation between winding pitch and pole pitch
(UPPCL-2016, TG2 Exam Date : 26-06-2016)

Ans : (a) The winding of a DC machine is said to be full pithched winding when winding pitch is equal to the pole pitch.
■Winding pitch (full pitch) = pole pitch = coil pitch = 180^0 electrically
■Short pitch winding in DC machine when,
winding pitch <Pole pitch

208. The condition for maximum efficiency in case of DC generator is
(a) variable loss = 1/constant loss
(b) variable loss = constant loss
(c) variable loss = 2×constant loss
(d) variable loss = 1/2× constant loss
(UPPCL-TG2-Electrical-2015)

Ans : (b) The condition for maximum efficiency in case of DC generator is variable loss = constant loss.
Mechanical lasses = Friction loss of bearings + friction loss at a commutator + windage loss.
Core loss = hysteresis loss + eddy current loss
Stray loss = mechanical loss + core loss.
Constant losses = shunt field copper losses+stray loss
Current at maximum efficiency (I_{max})
$$= I_{F.L.}\sqrt{\frac{\text{Constant loss}}{\text{Full load copper loss}}}$$

209. What is correct regarding lap and wave winding in D.C generator.
(a) Wave winding is used for high voltage and high current machine
(b) The number of parallel paths in lap winding is always two

(c) The number of parallel paths in the wave winding is always equal to the number of pole
(d) Lap winding is used for low voltage and high current machine

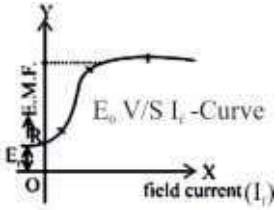
(UPPCL-TG-2 Electrician-2015)

Ans : (d) Lap winding is used for low voltage and high current machine. It is correct regarding lap winding in DC generator.

210. In DC shunt generator, the magnetizing characteristic curve is shows relationship between.
(a) Voltage generated on X axis and field current on Y axis
(b) E.M.F induced on X axis and armature current on Y axis
(c) E.M.F induced on Y axis and armature current on X axis
(d) E.M.F induced on Y axis and field current on X axis

(UPPCL-TG-2 Electrician-2015)

Ans : (d) In DC shunt generator, the magnetizing characteristics curve is show the relation between EMF induced on Y axis and field current on X axis.



211. What does the SAE number of lubricant oils used in diesel generator sets represent?
(a) Grade (b) Viscosity
(c) Flashpoint (d) Density

(UPPCL-TG-2 Electrician-2015)

Ans : (b) The SAE number of lubricant oils used in diesel generator sets represent viscosity.

212. What is the reason when a shunt generator does not produce voltage when rotated in the normal direction and normal speed?
(a) Contact resistance is more
(b) Armature resistance is more
(c) Field resistance is lower
(d) No residual magnetism in the pole

(UPPCL-TG-2 Electrician-2015)

Ans : (d) When a shunt generator does not produce voltage when rotated in the normal direction and at normal speed, the reason is no residual magnetism in the pole.

213. Which generator is used for charging the battery of an automobile?
(a) Series generator
(b) Differentially compound generator
(c) Shunt generator
(d) Long shunt compound generator

(UPPCL-TG-2 Electrician-2015)

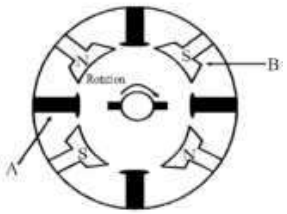
Ans : (c) D.C. shunt generator is used for charging the battery of an automobile.
■ DC shunt generator provides constant voltage supply.

214. A generator is run by a motor and takes 18.65A at 300 V. If its efficiency is 75%, then what is the Horse Power of the motor?
(a) 12 HP (b) 15 HP
(c) 10 HP (d) 7.5 HP

(UPPCL-TG-2 Electrical-2014), (IOF 2015)

Ans : (d) Given that,
V = 300V, I = 18.65 A
Input of the motor = VI
= 300 × 18.65
= 5595 Watt
Then HP rating of the motor = $\frac{5595}{746}$
= 7.5 HP

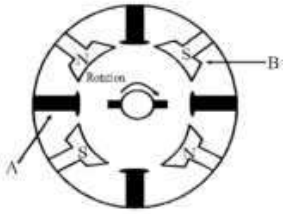
215. The parts A and B of a DC generator in the following figure depicts respectively.



(a) Commutator and Stator
(b) Stator and Interpole
(c) Interpole and Main pole
(d) Main Pole and Commutator

(UPRVUNL-TG-2 Electrical-2015)

Ans : (c) In parts A and B of a DC generator in the figure depicts respectively inter pole and main pole.



216. The generator used for normal lighting and power supply is
(a) DC shunt generator
(b) Series generator
(c) Cumulative Compound generator
(d) Differential Compound generator

(UPRVUNL-TG-2 Electrical-2015)

Ans : (c) The generator used for normal lighting and power supply is cumulative compound generator.
■ This generator is used for short distance.
■ Series generator is used for long distance.
Application of d.c. Generator-
(i) Shunt Generator- They are also used for charging batteries because their terminal voltages are almost constant or can be kept constant.
(ii) Series Generator-
They are not used for power supply because of their rising characteristics.
■ Used as boosters.
■ Used as railway service.

(iii) Compound Generator -

A. Cumulative -Compound Generator -Which require d.c. supply at constant voltage, for lamp loads and for heavy power service such as electric railways.

B. Differential Compound Generator- It is widely used in arc welding where larger voltage drop is desirable with increase in current.

217. What will be the field winding copper losses of a DC generator when the current flowing is 10 A and inter pole resistance is 10 ohm?

(a) 100 W (b) 1000 W
(c) 1 W (d) 10 W

(UPRVUNL-TG-2 Electrical-2015)

Ans : (b) Given that,
Current (I) = 10A
Resistance (R) = 10Ω
Copper loss = $I^2 R$ = ?
= $(10)^2 \times 10$
Copper loss (P_{cu}) = 1000 Watt

218. To improve the armature reaction of DC generator the brush.

(a) Lead is provide in the direction of rotation of the armature
(b) Back lead is provide in the direction of
(c) Can not tested
(d) None of these

(DMRC Maintainer Electrical-2014)

Ans : (a) Brush lead is provide in the direction of rotation of the armature to improve the armature reaction of DC generator.

219. The voltage regulation of a DC generator at full load being zero implies that the generator is

(a) Series
(b) shunt
(c) comulatively compounded
(d) Differentially compounded

(DMRC Maintainer Electrical-2014)

Ans : (c) The voltage regulation of a DC generator at full load being zero implies that the generator is cumulatively compounded.
■ The voltage regulation of flat or level compounded DC generator is zero.
■ The voltage regulation of under compounded DC generator is lagging.
■ The voltage regulation of over compounded DC generator is leading.

220. A 4-pole DC generator runs at 1800 r.p.m. the frequency of armature current is -

(a) 25Hz (b) 30Hz
(c) 50Hz (d) None of these

(DMRC Maintainer Electrical-2014)

Ans : (d) Given that,
Speed (N_s) = 1800 r.p.m.
Pole (P) = 4
Frequency (f) = ?
Formula -

$$N_s = \frac{120f}{P}$$

$$f = \frac{N_s P}{120} = \frac{1800 \times 4}{120} = 60\text{Hz}$$

221. Tension in brushes of DC generator is quite important for its working; while excess tension in brushes causes :

(a) velocity of machine to decrease
(b) output voltage to decrease
(c) output voltage to increase
(d) over heating of commutator and surface wear out

(LMRC Maintainer Electrical Exam 2016)

Ans : (d) Tension in brushes of DC generator is quite important for its working; while excess tension in brushes causes over heating of commutator and surface wear out.

222. Generator used in arc welding is–

(a) DC series generator
(b) DC shunt generator
(c) DC compound differential generator
(d) DC cumulative compound generator

(LMRC Maintainer Electrical Exam 2016)

Ans : (c) DC compound differential generator is used in arc welding because of their drooping characteristics.
■ Series generator has the poorest voltage regulation.
■ Cumulative compound generator has the best voltage regulation.
■ Shunt generator is used in battery charging.

223. What do we call a winding when the ends of a coil are joined to a commutator bar at a distance of one pole pitch?

(a) Lap winding
(b) Wave winding
(c) Ring winding
(d) Rectangular winding

(LMRC Maintainer Electrical Exam 2016)

Ans : (b) When the ends of a coil are joined to a commutator bar at a distance of one pole pitch is called wave winding.

224. The process of joining ends of a coil on a commutator segment is called –

(a) commutator connection
(b) coil connection
(c) slot connection
(d) point connection

(LMRC Maintainer Electrical Exam 2016)

Ans : (b) The process of joining ends of a coil on a commutator segment is called coil connection.

225. Level compounded DC generator is used for the following purpose is-

(a) Electrical Arc welding
(b) Electric Traction
(c) Charging the battery
(d) Lighting

(DMRC Maintainer Electronic EXAM , 2014)

Ans : (d) Level compounded DC generator is used for the lighting purpose.

226. The formula to find EMF induced (E) in DC generator is ..... (Φ = Average magnetic flux per pole, Z = Total number of conductors, N = speed of rotation in rpm , P = Number of poles, A = Number of parallel paths)

(a) $E = \frac{\phi ZN}{60} \times \frac{P}{A}$ volts

(b) $E = \frac{\phi ZN}{60} \times \frac{A}{P}$ volts

(c) $E = \frac{\phi ZP}{60} \times \frac{A}{P}$ volts

(d) $E = \frac{\phi ZN}{120}$ volts

(ISRO Technician Electrical 27.11.2016)

Ans : (a) Induced EMF in generator

$\because$ Number of armature revolution per minute = N

$\therefore$ Number of armature revolution per second $= \frac{N}{60}$

$\because$ Time taken in $\frac{N}{60}$ revolution = 1 sec.

$\therefore$ Time taken in 1 revolution $dt = \frac{60}{N}$ sec

According to Farraday's law of electromagnetic induction

EMF per conductor $E = \frac{d\phi}{dt} = \frac{\phi PN}{60}$ Volt

Number of conductors in parallel path $= \frac{Z}{A}$

E = Average induced EMF per conductor × Number of conductors in parallel path

$$E = \frac{\phi PN}{60} \times \frac{Z}{A}$$

227. Which type of generator gives a constant voltage output at all loads ?

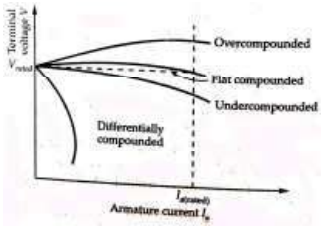
(a) level compound generator
(b) cumulative compound generator
(c) differential compound generator
(d) series generator

(ISRO Technician Electrical 27.11.2016), (IOF 2014)

Ans : (a) Level compound generator gives a constant voltage output at all loads.

■ Over compound generator gives a leading voltage regulation

■ Under compound generator gives a lagging voltage regulation.



228. Load saturation characteristics of a DC generator gives relation between:

(a) E and I_f (b) V and I_f
(c) V and I_a (d) None of these

(DMRC Maintainer Electrician 2017)

Ans : (b) Load saturation characteristics of a DC generator gives relation between V and I_f.

Characteristics of D.C. Generator-

(i) No-load saturation characteristics Or magnetic characteristic Or open circuit characteristic (O.C.C.)	E_0/I_f
(ii) Internal or total characteristics	E/I_a
(iii) External characteristics	V/I

Where,
E_0 = No load Generated emf in armature
I_f = Field or exciting current
E = Induced emf in armature.
I_a = Armature current
V = terminal voltage
I = Load current.

229. In dc generators iron losses are made up of–

(a) hysteresis and friction losses
(b) hysteresis, eddy current and brush contact losses
(c) hysteresis and eddy current losses
(d) hysteresis, eddy current and copper losses

(UPPCL Electrician TG-2 Trainee 16.10.2016, Re-Exam), (IOF 2012, 2017)

Ans : (c) In DC generators iron losses are made up of hysteresis and eddy current losses.

Iron loss = hysteresis loss + eddy current loss.

Hysteresis loss = $K_h B_m^{1.6} f V$ Watt

Eddy current loss = $K_e B_m^2 f^2 t^2 V$ Watt

Where,

B_m = Maximum flux density (Wb/m^2)
f = Frequency of supply (Hz)
V = Volume of the material (m^3)
t = Thickness of lamination (m)
K_h = Hysteresis constant
K_e = Eddy current constant

230. A constant-voltage generator has–

(a) minimum efficiency
(b) minimum current capacity
(c) low internal resistance
(d) high internal resistance

(UPPCL Electrician TG-2 Trainee 16.10.2016, Re-Exam)

Ans : (c) A constant-voltage generator has low internal resistance because if the value of internal resistance is high, losses will be high.

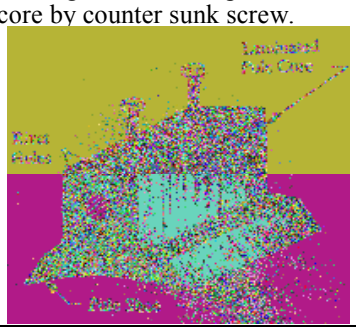
■ Due to which constant voltage cannot be obtained in the generator.

231. In DC generators the pole shoes are fastened to the pole core by–

(a) rivets (b) counter sunk screw
(c) brazing (d) welding

(UPPCL Electrician TG-2 Trainee 16.10.2016, Re-Exam)

Ans : (b) In DC generators the pole shoes are fastened to the pole core by counter sunk screw.



232. In lap winding the number of brushes is always–

(a) double the number of poles
(b) same as the number of poles

(c) half the number of poles
(d) two

(UPPCL Electrician TG-2 Trainee 16.10.2016, Re-Exam), (IOF 2015)

Ans : (b) In lap winding the number of brushes is always same as the number of poles. [A=P]

A = No of parallel paths
P = No of poles

■ Number of parallel paths are equal number of brushes.
■ In wave winding number of brushes are equal to two. [A=2].

233. The e.m.f. generated in a dc generator is directly proportional to–
(a) flux/pole
(b) speed of armature
(c) number of poles
(d) all of these

(UPPCL Electrician TG-2 Trainee 16.10.2016, Re-Exam)

Ans : (d) The e.m.f generated in a dc generator is directly proportional to the flux/pole, speed of armature, number of poles and inversely proportional to the number of parallel paths.

$$E_g = \frac{\phi ZPN}{60 \times A}$$

E_g = induced emf in dc generator
ϕ = flux/pole
Z = Total No of conductors
P = No of poles
N = Speed of armature
A = No of parallel path

234. In context with armature reaction of a DC generator, the MNA stands for:
(a) Main Neutral Arm
(b) Main Neutral Axis
(c) Magnetic Neutral Arm
(d) Magnetic Neutral Axis

(UPPCL Technical Grade-II Electrical 11.11.2016)

Ans : (d) In context with armature reaction of a DC generator the MNA stands for magnetic neutral axis.
■ Magnetic neutral axis [M.N.A] is the axis on which no electro magnetic force is induced in stationary armature conductors.

235. Armature in a DC machine, moves in_____.
(a) moving yoke
(b) static stator
(c) moving stator
(d) static commutator

(UPPCL Technical Grade-II Electrical 11.11.2016)

Ans : (b) Armature in a dc machine moves in static stator.
■ The armature core is keyed to the machine shaft and rotates between the field poles.
■ It consists of slotted soft-iron laminations (about 0.4 to 0.6 mm thick) that are stocked to form a cylindrical core.
■ Armature core is made of silicon steel laminations which are insulated from each other by insulating varnish coating.
■ These laminations are used to reduce eddy current losses.

236. How many magnetic poles are there in a simple DC machine?
(a) 1 (b) 2 (c) 4 (d) 6

(UPPCL Technical Grade-II Electrical 11.11.2016)

Ans : (c) There are 4 magnetic poles in a simple D.C machine.
■ For high speed the number of poles is kept less.

237. If the resistance in the coil is 4 ohms and the current passing through it is 20A, what is the armature copper losses generated in the DC generator?
(a) 80 W (b) 40 W
(c) 320 W (d) 1600 W

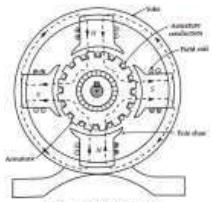
(UPPCL Technical Grade-II Electrical 11.11.2016)

Ans : (d) Given that,
I = 20A
R = 4Ω
Armature copper losses = $I^2 R$
$= (20)^2 \times 4 = 400 \times 4$
Armature copper losses = 1600 Watt

238. Which of the following is not a part of Rotor in DC generator?
(a) Fan blade (b) Brush holder
(c) Bearing plate (d) Base plate

(UPPCL Technical Grade-II Electrical 11.11.2016)

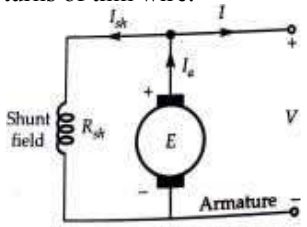
Ans : (d) Base plate is not a part of rotor in DC generator.


Magnetic circuit of a 4-pole d.c. generator.

239. Thin wire and more turns is found in which of the following windings?
(a) Shunt winding
(b) Series winding
(c) Series and shunt winding both
(d) Neither shunt nor series winding

(UPPCL Technical Grade-II Electrical 11.11.2016)

Ans : (a) Thin wire and more turns is found shunt winding of D.C generator.
■ Main purpose of shunt winding of DC generator is to create field or magnet.
■ Shunt winding is connected in parallel with armature and has more turns of thin wire.



Shunt wound d.c. generator

240. In wave winding of a DC generator, if 4 conductors in armature having 8 poles rotate with a speed of 600 rpm generates a magnetic flux of 0.5 weber, what will be the magnitude of induced emf?