

Youth Competition Times

**ODISHA JUNIOR ENGINEER,  
ASSISTANT ENGINEER, ASSISTANT  
EXECUTIVE ENGINEER AND  
ENGINEERING SERVICES**

**ODISHA  
CIVIL ENGINEERING**  
[English Medium]

**Previous Years Objective Solved Papers**

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## Odisha Civil JE & PSC Previous Exam Papers Analysis Chart

Sl No.	Exam	Proposed Year	Question Paper	Total Question
	OPSC AEE (Panchayati Raj) Paper-II	24.08.2021		150
	OPSC ASCO, Paper-I	2021		100
	OPSC ASCO, Paper-II	2021		100
	OPSC AE CIVIL	29.11.2020		100
	OPSC AAO Asst. Agri Engg, Paper I	2020		100
	OPSC AAO Asst. Agri Engg, Paper II	2020		100
	OPSC AEE, Paper- I	2019		180
	OPSC AEE, Paper- II	2019		180
	OSSC JE (Shift-I)	2019		100
	OSSC JE (Shift-II)	2019		100
	OSSC JE (Shift-III)	2019		100
	OPSC Poly. Lect., Paper-I	2018		100
	OPSC Poly. Lect., Paper-II	2018		100
	OPSC AEE, Paper-I	2016		90
	OPSC AEE, Paper-II	2016		90
	Odisha JE (Main)	2014		100
	OSSC JE	2014		60
	Odisha Civil Service	2011		120
	Odisha Civil Service	2006		120
			<b>Total</b>	<b>2090</b>

## Odisha Staff Selection Commission

### Plan and pattern of Examination:-

(a) There shall be two stages of examination.

- (i) Preliminary Examination
- (ii) Main Written examination
- (iii) Certificate verification.

Stage of Examination	Type of Examination	No of paper & Marks	Total Marks	Duration	Remark
<b>Stage-I</b>	Preliminary Examination	<b>One Paper–</b> <ul style="list-style-type: none"> <li>• Arithmetic-10th standard.</li> <li>• Data Interpretation (Chart, Graph, Table, Data, Sufficiency etc.) 10th standard</li> <li>• Logical Reasoning and Analytical Ability, General Mental Ability.</li> <li>• Current Events of national and International Importance.</li> <li>• Computer/internet Awareness</li> </ul>	150	150 minutes	<ul style="list-style-type: none"> <li>• The question will be of MCQ type.</li> <li>• There shall be negative marking @ 0.25 marks for each wrong answer.</li> <li>• Approximately 5 times of number vacancies category wise and post wise shall be shortlisted for the Main written Examination.</li> <li>• The commission at their discretion may fix minimum qualifying mark in Preliminary Examination in different categories for different technical posts/Services.</li> </ul>
<b>Stage-II</b>	Main Written Examination	<b>Technical Paper–</b> There shall be different Technical papers for different posts/services as per qualification prescribed for the post. (Detail Syllabus annexed as Regulation 2 of 2022)	200	3 hours (180 minutes)	Candidates up to 2(two) times the vacancies advertised in each category, in each posts in order of merit basing on the marks in Written Examination shall be shortlisted for the verification of original documents.
<b>Stage-III</b>	Certificate Verification				The candidate who fails to attend the document verification, his/her name will not be considered for the post.

# Syllabus

## Civil Engineering Materials Syllabus

■ Stone, Bricks ■ Clay Products And Refractory Materials ■ Cement ■ Sand ■ Gravel ■ Morrum And Fly Ash ■ Mortar and concrete ■ Timber ■ Paint ■ Varnish and distemper ■ Iron and steel ■ Bituminous Materials ■ Plastics ■ Heat Proofing and Acoustic materials.

## Construction Technology Syllabus

■ Introduction to Construction Technology ■ Site Investigation ■ Foundations ■ Walls ■ Damp Proofing ■ Arches and Lintels ■ Doors and Windows ■ Floors ■ Roofs ■ Stairs ■ Surface Finishes ■ General idea of Seismic Planning ■ Design of Building ■ Construction Machineries.

## Structural Analysis:-

■ Trusses and frames ■ Slope and deflection ■ Fixed beam ■ Continuous beam ■ Slope deflection Method ■ Moment Distribution Method ■ Three Hinged Arches.

## Transportation Engineering Syllabus

■ Introduction to transportation Engineering ■ Road Geometric ■ Road Materials ■ Hill Roads ■ Road Drainage ■ Road maintenance ■ Construction Equipments ■ Traffic Studies ■ Landscaping And Arboriculture ■ Introduction to Railways Transportation ■ Permanent Way ■ Track materials ■ Geometric for Broad Gauge ■ Points and Crossings ■ Laying And maintenance to Track ■ Introduction to Bridges ■ Hydrology and planning ■ Bridge Foundation ■ Bridge Substructure and Approaches ■ Permanent Bridges ■ Culvert and Causeway ■ Introduction To Docks and harbors ■ Break Waters Docks ■ Introduction to Airport engineering ■ Components of An Airport ■ Tunnel Engineering

## Irrigation Engineering Syllabus

■ Introduction To Irrigation Engineering ■ Hydrology ■ Water Requirement of Crops ■ Flow Irrigation ■ Diversion Head Works ■ Regulatory Works ■ Cross Drainage works ■ Dams ■ Water Logging And Drainage ■ Ground Water Hydrology

## Estimating:

■ Introduction to Estimating ■ Detailed Estimate of Building As per PWD specifications and standards ■ Analysis of Rates ■ Administrative Setups of Engineering Organizations ■ Detailed Estimate of Culverts and Bridges ■ Estimate of Irrigation Structures ■ Detailed Estimate of Roads ■ PWD Accounts Works.

## Structural Design Syllabus

■ Introduction to Design And Detailing ■ Working stress Method of Design ■ Limit State Method (LSM) of design ■ Limit state of collapse of singly Reinforced members In bending ■ Limit state of collapse in shear ■ Bond Anchorage ■ Development Lengths And Slicing (LSM) ■ Beams (LSM) TWO Way Slabs (LSM) ■ Axially Loaded short columns (LSM) ■ Ductile detailing of Reinforced concrete structures ■ Design of steel ■ Design of timber Structures (Limit State) ■ Structural Steel Fasteners and Connections ■ Design of Tension Members ■ Design of column Bases and foundations ■ Design of Steel Beams ■ Design of Timber structures ■ Stair case (RCC-LSM) ■ Design of Footings (RCC-ISM)

## Public Health Engineering Syllabus

■ Introduction to water supply Engineering ■ Quantity of water ■ Sources of water ■ Conveyance of Water Quality of Water and Treatment of Water ■ Distribution system ■ Appurtenance In Distribution System ■ Water Supply Plumbing In Building ■ Introduction to Sanitary Engineering ■ Quantity of Sewage ■ Sewerage System ■ Sewer Appurtenance ■ Sewage Characteristics ■ Sewage Disposal ■ Sewage Treatment ■ Sanitary Plumbing for Building And Rural Water Supply Sanitation

## Construction Management Syllabus

■ Introduction to Construction management ■ Construction Planning ■ Materials management ■ Site management ■ Construction organization ■ Labor management ■ Equipment management ■ Quality Control ■ Monitoring Progress in Construction Works ■ Safety Management in Construction Works

## Advanced Construction Technology Syllabus

■ Concrete Mixed Design ■ Handling And Transporting of Concrete ■ Earthquake Resistant Construction ■ Building Services ■ Construction And Earth Moving Equipment



# Odisha Public Service Commission

## (AEE, Panchayati Raj)

### Exam- 2021 (Paper-II)

1. In solid mechanics the strength of materials may be regarded as

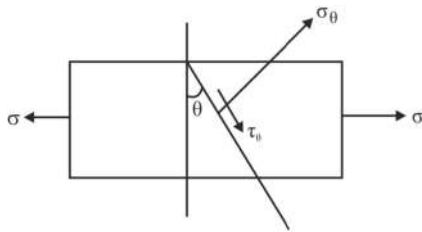
- (a) The statics deformable or elastic bodies
- (b) The statics of strength and stiffness of bodies
- (c) The statics of rigid bodies
- (d) The statics of modulus of resilience

**Ans. (a) :** Strength of material is the study of deformable or elastic bodies and we study different properties of material by applying force on it.

2. A prismatic bar is subjected to axial tension. What is the aspect angle which defines an oblique section on which the normal and shearing stresses are equal?

- (a)  $90^\circ$
- (b)  $45^\circ$
- (c)  $135^\circ$
- (d)  $180^\circ$

**Ans. (b)**



$$\sigma_\theta = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cos 2\theta + \tau_{xy} \sin 2\theta$$

$$\tau_\theta = -\left(\frac{\sigma_x - \sigma_y}{2}\right) \sin 2\theta + \tau_{xy} \cos 2\theta$$



$$\sigma_x = \sigma$$

$$\sigma_y = 0$$

$$\tau_{xy} = 0$$

$$\therefore \sigma_\theta = \frac{\sigma}{2} + \frac{\sigma}{2} \cos 2\theta$$

$$\tau_\theta = -\frac{\sigma}{2} \sin 2\theta$$

$$\sigma_\theta = \tau_\theta \text{ (given)}$$

$$\frac{\sigma}{2} + \frac{\sigma}{2} \cos 2\theta = -\frac{\sigma}{2} \sin 2\theta$$

$$\frac{\sigma}{2} = -\frac{\sigma}{2} (\sin 2\theta + \cos 2\theta)$$

$$\cos 2\theta + \sin 2\theta = -1$$

$$(\cos 2\theta + 1) = -\sin 2\theta$$

$$2\cos^2 \theta = -2 \sin \theta \cos \theta$$

$$\tan \theta = -1$$

$$\theta = 135^\circ$$

$$\theta_1 = \theta - 90^\circ$$

$$= 135^\circ - 90^\circ$$

$$= 45^\circ$$

3. Modulus of resilience can be defined as

- (a) Strain energy/volume
- (b) Kinematic energy/potential energy
- (c) Volume/energy
- (d) Potential energy/moment of inertia

**Ans. (a) : Modulus of resilience**– The proof resilience per unit volume of a material is known as modulus of resilience.

$$\text{Modulus of resilience} = \frac{\text{Strain energy}}{\text{Volume}} = \frac{\sigma_y^2}{2E}$$

4. A prismatic steel rod of length L and cross sectional area A hangs vertically under its own weight. What is the strain energy stored in the bar, if its unit weight per unit volume is  $\gamma$  (E is Young's Modulus)?

- (a)  $\gamma^2 AL^3/6E$
- (b)  $\gamma AL^2/6E^3$
- (c)  $\gamma^2 AL^2/6E$
- (d)  $\gamma^3 AL/6E^2$

**Ans. (a) :** Given, length of rod = L

Cross sectional area = A

Unit weight of bar per unit volume =  $\gamma$

Young modulus of bar = E

Consider an element at a distance x from the lower free end.

Let the thickness of the element = dx

The section x-x will be acted upon by the weight of the bar of length x.

$w_x$  = weight of the bar of length x

= (volume of the bar of length x)  $\times$  weight of unit volume

$w_x = (A \times x) \times \gamma = \gamma Ax$ .

Let due to self weight  $w_x$  elongation is d $\delta$

$$\text{Strain in portion } dx = \frac{\text{Elongation in } d\delta}{\text{Length of } dx}$$

$$= \frac{d\delta}{dx}$$

$$\text{Stress in portion } dx = \frac{\text{Weight action on section } x-x}{\text{Area of section}}$$

$$= \frac{\gamma \cdot A \cdot x}{A} = \gamma x$$

$$E = \frac{\text{Stress}}{\text{Strain}} = \frac{\gamma \cdot x}{\left(\frac{d\delta}{dx}\right)}$$

$$d\delta = \frac{\gamma \cdot x \cdot dx}{E}$$

Now the strain energy stored in portion  $dx$  is

$dU = \text{Average weight} \times \text{Elongation of } dx$

$$= \left(\frac{0 + w_x}{2}\right) \times d\delta$$

$$dU = \frac{w_x}{2} \times \frac{\gamma \cdot x \cdot dx}{E}$$

$$dU = \frac{1}{2} \cdot \gamma^2 \cdot A \cdot \frac{x^2 dx}{E}$$

$$U = \int_0^L dU$$

$$U = \int_0^L \frac{1}{2} \cdot \gamma^2 \cdot \frac{A}{E} \cdot x^2 dx$$

$$U = \frac{1}{2} \cdot \frac{\gamma^2 A}{E} \times \left[ \frac{x^3}{3} \right]_0^L$$

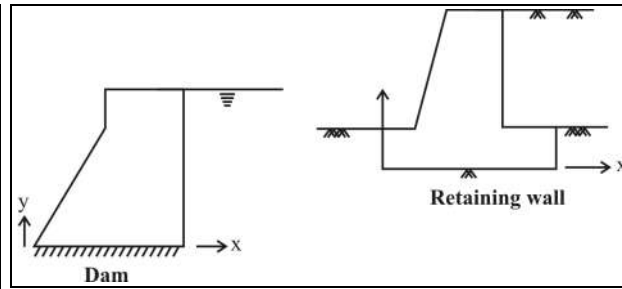
$$U = \frac{1}{2} \cdot \frac{\gamma^2 A}{E} \times \frac{L^3}{3} = \frac{\gamma^2 AL^3}{6E}$$

### 5. In plane strain protection

- The loading is in two directions
- There is no normal and shear stresses on the two plane (X any Y) perpendicular to the z direction
- The stress vector is zero across a particular plane
- The loading is axiymetric and does not vary in axial direction

**Ans. (d) : Plain strain problem**– Involving long bodies whose geometry and loading do not vary significantly in the longitudinal direction are referred to as plain strain problems. In this case strain component  $\epsilon_{zz}$ ,  $\epsilon_{yz}$  &  $\epsilon_{xz}$  are taken as zero, where z-axis is the longitudinal axis.

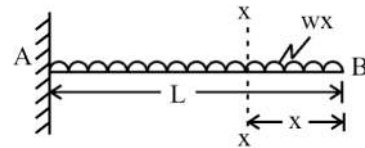
**Example**– Dam and reservoirs are subjected to water pressure loading.



6. A cantilever beam of length 5m, subjected to a uniformly distributed load of 20 kN/m. The bending moment of its free end is equal to

- 20 kNm
- 10 kNm
- Zero
- 200 kNm

**Ans. (c) :**  $L = 5$  m,  $W = 20$  kN/m



$$M_{x-x} = wx \frac{x}{2}$$

$$M_{x-x} = \frac{wx^2}{2}$$

$$x = L = 0$$

$$M_B = \frac{wL^2}{2}$$

$$\therefore L = 0$$

$$M_B = 0$$

The bending moment at the free end will be zero.

7. In an element  $\sigma_x = -\sigma_y = 30$  KPa, if  $E = 210$  KPa and  $\mu = 0.25$ , the shearing strain is

- 0.0025
- 0.0030
- 0.0035
- None of these

**Ans. (d) :**

Poisson ration ( $\mu$ ) = 0.25

$\sigma_x = -\sigma_y = 30$  kPa

$E = 210$  kPa

$$\text{Shear strain, } e = \frac{1-2\mu}{E} (\sigma_x + \sigma_y + \sigma_z)$$

$$e = \frac{1-0.25 \times 2}{210} (30+30)$$

$$e = \frac{1-0.25 \times 2}{210} (60) = \frac{0.5 \times 60}{210}$$

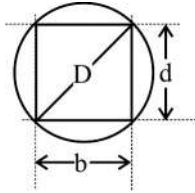
$$e = \frac{3}{21} = \frac{1}{7} = 0.142$$

$$e = 0.142$$

8. The ratio of depth of width of strongest beam that can be cut out of a cylindrical log of wood with homogenous and isotropic properties is

- (a) 1.414 (b) 1.25  
(c) 0.707 (d) 0.504

Ans. (a)



From bending equation

$$\sigma = \frac{My_{\max}}{I}$$

$$Z = \frac{bd^2}{6}$$

$$b^2 + d^2 = D^2$$

For maximum section modulus

$$\frac{dz}{db} = 0 \Rightarrow \frac{\partial [b(D^2 - b^2)]}{\partial b} = 0$$

$$\Rightarrow D^2 - 3b^2 = 0$$

$$b = \frac{D}{\sqrt{3}}$$

$$d = \sqrt{\frac{2}{3}}D$$

Ratio of d & b

$$\frac{d}{b} = \frac{\sqrt{\frac{2}{3}}D}{\frac{D}{\sqrt{3}}} = \sqrt{\frac{2}{3}} \cdot \sqrt{3} = \sqrt{2}$$

$$\frac{d}{b} = \sqrt{2} \text{ or } 1.414$$

9. Using the Maximum stress theory and maximum shear theory of failure, the ratios of the diameter of circular shaft is as follows

- (a) 1 : 1.90 : 1.26 (b) 1 : 1.52 : 2.15  
(c) 1 : 1 : 1 (d) 1 : 2.17 : 3.52

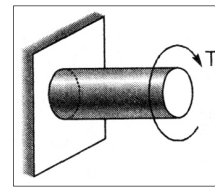
Ans. (a) : Using the Maximum stress theory and maximum shear theory of failure, the ratios of the diameter of circular shaft is 1 : 1.90 : 1.26.

10. If a circular shaft is subjected to a torque T and bending moment M, the ratio of maximum bending stress to maximum shear stress is

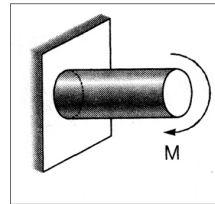
- (a) 2 T/M (b) M/T  
(c) M/2T (d) 2M/T

Ans. (d) : Maximum shear stress developed by the shaft-

$$\Rightarrow \tau_{\max} = \frac{16T}{\pi D^3}$$



$$\Rightarrow \sigma_b = \frac{32M}{\pi D^3} \text{ (Maximum bending stress)}$$



The ratio of the maximum bending stress to maximum

$$\text{shear stress is } \frac{\sigma_{cb \max}}{\tau_{\max}} = \frac{32M}{\pi D^3} \times \frac{\pi D^3}{16T}$$

$$\left[ \frac{\sigma_{cb \max}}{\tau_{\max}} = \frac{2M}{T} \right]$$

11. Consider the following statements :

The theory of simple bending assumes that :

- (1) The material of the beam is homogenous, isotropic and obeys Hook's law
  - (2) The plane section remains plane after bending
  - (3) Each cross section of the beam is symmetric about the loading plane
  - (4) Young's moduli are the same in tension and compression of the above statements which are correct?
- (a) 1 and 2 only (b) 1, 3 and 4 only  
(c) 2, 3 and 4 only (d) 1, 2, 3 and 4 only

Ans. (d) Assumptions in theory of bending-

- (i) Plane section before bending remains plane after bending.
- (ii) Material is homogeneous, isotropic and obey's hook's law.
- (iii) Modulus of elasticity in tension & compression is same.
- (iv) Beam is initially straight and has constant x-section, throughout its length (i.e. prismatic)
- (v) The plane of loading must contains a principal axis of cross-section of beam and load must be perpendicularly to the longitudinal axis of the beam.

12. If the depth of a beam of rectangular section is reduced to half, strain energy stored in the beam due to bending becomes

- (a) 8 time (b) 4 time  
(c) 1/4 time (d) 1/8 time

Ans. (a) : Strain energy due to bending.

$$d_1 = d, d_2 = d/2$$

$$U = \frac{M^2 \ell}{2EI}$$

$$U_1 \propto \frac{1}{I}$$

$$U_1 = \frac{12}{bd_1^3}$$

$$U_1 = \frac{12}{b(d/2)^3} = \frac{12 \times 8}{bd^3}$$

$$U_2 = U_1 \times 8$$

$$U_2 = 8 \times U_1$$

13. A steel wire of 20 mm diameter is bent into a circular shape of 10 m radius. If the young's modulus of elasticity of the wire is  $2 \times 10^6$  kg/cm<sup>2</sup>, then the maximum stress induced in the wire is

- (a)  $2 \times 10^3$  kg/cm<sup>2</sup>      (b)  $3 \times 10^3$  kg/cm<sup>2</sup>  
 (c)  $4 \times 10^3$  kg/cm<sup>2</sup>      (d)  $5 \times 10^3$  kg/cm<sup>2</sup>

Ans. (a) :

$$\frac{M}{I} = \frac{\sigma_{\max}}{y} = \frac{E}{R}$$

$$\frac{\sigma_{\max}}{y} = \frac{E}{R}$$

Given,  $d = 20$  mm,  $R = 10$  m = 1000 cm,  
 $y = d/2 = 10$  mm = 1 cm,  $E = 2 \times 10^6$  kg/cm<sup>2</sup>

$$\sigma_{\max} = \frac{E \times y}{R}$$

$$= \frac{2 \times 10^6 \times 1}{1000}$$

$$\sigma_{\max} = 2 \times 10^3$$

14. If the area under the shear force diagram curve for a beam between two points C and D is 'X', then the difference between the moments at the two points C and D will be equal to

- (a)  $x/4$       (b)  $x/3$   
 (c)  $x/2$       (d)  $x$

Ans. (d)

$$\frac{dM_x}{dx} = S_{f_{xx}}$$

$$\int_D^C dM_x = \int_D^C S_{f_{xx}} \cdot dx = \text{Area under the shear curve.}$$

$$M_C - M_D = X$$

15. The Poisson's ratio of structural steel is

- (a) 0.3 m      (b) 1.0 m  
 (c) 1.2 m      (d) None of the above

Ans. (a) : The Poisson's ratio of structural steel is 0.3 m.

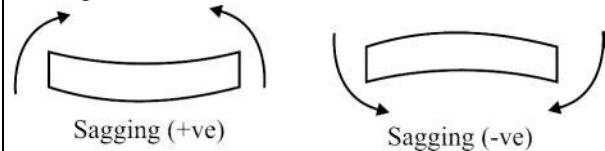
Material		Poisson ratio
Rubber	–	0.5
Gold	–	0.42
Copper	–	0.33
Cast iron	–	0.2 to 0.3

Steel	–	0.27 to 0.3
Clark	–	0

16. A beam of uniform strength has constant

- (a) Shear force  
 (b) Bending moment  
 (c) Cross sectional area  
 (d) deflection

Ans. (b) : A beam of uniform strength has constant bending moment.



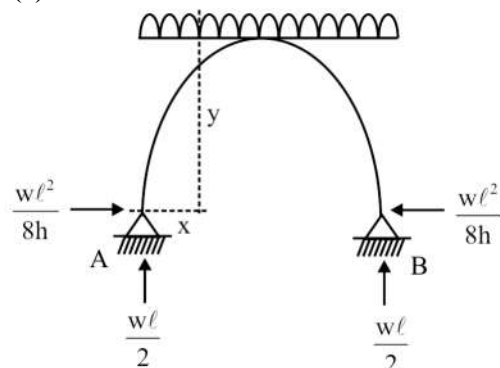
Bending moment is the algebraic sum of moment at that section but moment at a point is the summation of moment due to all loading on the beam produced at that point.

$$\frac{dM}{dx} = V$$

17. A three hinged parabolic arch of 20 m span is subjected to 10 kN/m uniformly distributed load. What is the value of BM at 5 m from left support?

- (a) zero      (b) 243 kNm  
 (c) 200 kNm      (d) 100 kNm

Ans. (a) :



$$\begin{aligned} (BM)_{@5m} &= R_A \times 5 - H \times y - \frac{10 \times 5^2}{2} \\ &= 100 \times 5 - \frac{500}{h} \left( \frac{4hx(\ell - x)}{\ell^2} \right) - 125 \\ &= 0 \end{aligned}$$

Note : The bending moment throughout the span will be zero for a three hinged parabolic arch subjected to uniformly distributed load.

18. A fixed beam has how many number of kinematic indeterminacy?

- (a) 3      (b) 0  
 (c) 2      (d) 1

Ans. (b) : A fixed beam has number of kinematic indeterminacy is zero. Because every movement is restricted.



19. Choose the correct and answer

- (i) The displacement method is more useful when degree of kinematic indeterminacy is less than the static indeterminacy
  - (ii) The force method is more useful when degree of static indeterminacy is less than the kinematic indeterminacy
  - (iii) The force method is more useful when degree of kinematic indeterminacy is less than the static indeterminacy
  - (iv) The displacement method is more useful when degree of static indeterminacy is less than the kinematic indeterminacy
- (a) (i) and (ii)                      (b) (i) and (iii)  
 (c) (ii) and (iii)                    (d) (iii) and (iv)

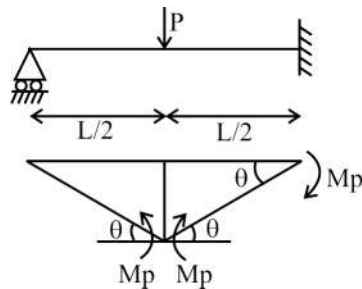
**Ans. (a) :** In the displacement method, generally all joint displacements are prevented regardless of the choice of the unknown displacement. A displacement of a joint affects only the member meeting at the given joint.

- When static indeterminacy is the less than the kinematic, the force method is preferred, otherwise the displacement is preferred.
- The displacement method is more useful when degree of kinematic indeterminacy is less than the static indeterminacy.

20. A propped cantilever of span L is subjected to concentrated load at mid span. If  $M_p$  is plastic moment capacity of the beam the value of the collapse load will be

- (a)  $4 M_p/L$                       (b)  $8 M_p/L$   
 (c)  $16 M_p/L$                     (d)  $6 M_p/L$

**Ans. (d) :**



By principle of virtual work.

$$w_e = w_i$$

$$P \left( \frac{L}{2} \right) \theta = 3 M_p \theta$$

$$3 M_p = \frac{PL}{2}$$

$$\text{Collapse load, } P = \frac{6M_p}{L}$$

21. The Muller-Breslau principle can be used to

- (a) Determinate shape of the influence line
- (b) Indicates the parts of the structure to be loaded to obtain the maximum effect
- (c) Calculate the ordinates of influence lines
- (d) All of the above

**Ans. (d) : Muller-Breslau Principle –**

- According to this principle ILD for any stress function can be obtained by removing the restraint offered by that stress function and introducing a directly related generalized unit displacement at the location and in the direction of the function.
- It is suitable for all type of statically determinate and only linear elastic indeterminate structure.
- It is not applicable for moving unit point moment and for deflection.
- This principle based virtual work theorem.
- It determines shape, ordinate and effect of stress function of the structure.

22. When a structure is just on the point of collapse, the necessary and sufficient conditions attending collapse are

- (i) Equilibrium condition
- (ii) Yield condition
- (iii) Mechanism condition

Choose the correct option–

- (a) In lower bound theorem (i) and (iii) are considered
- (b) In upper bound theorem (i) and (iii) are considered
- (c) In lower bound theorem (ii) and (iii) are considered
- (d) In lower bound theorem (ii) and (iii) are considered

**Ans. (b) :** When a structure is just on the point of collapse, the necessary and sufficient conditions attending collapse are in lower bound theorem equilibrium condition and mechanism condition are considered.

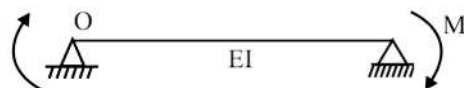
23. The carry over factor in a prismatic member whose far end is hinged is

- (a) 0                                  (b)  $1/2$   
 (c)  $3/4$                               (d) 1

**Ans. (a) :** Carry over factor is defined as the ratio of the moment at the far end to the moment at the rotating near end.

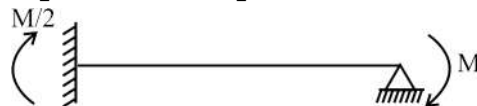
- If far end is hinged –

$$\left[ \text{COF} = \frac{0}{M} = 0 \right]$$

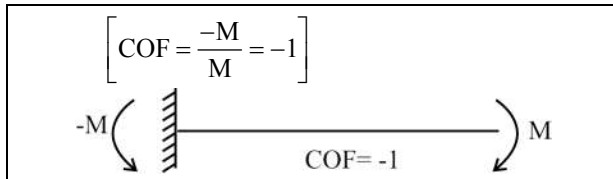


- If far end is fixed–

$$\left[ \text{COF} = \frac{M/2}{M} = \frac{1}{2} \right]$$



- If far end is fixed and near is free–



24. A structure is statically indeterminate to second degree. What is the maximum number of plastic hinges required to make this structure a mechanism?

- (a) 1 (b) 4  
(c) 3 (d) 2

**Ans. (c) :** Plastic hinges required to render structure mechanism is one greater than degree of indeterminacy.  
 Plastic hinges (n) = Degree of indeterminacy + 1  
 $n = D_s + 1$   
 $n = 2 + 1$   
 $n = 3$   
 • 3 number of plastic hinges required for indeterminacy of degree 2.

25. If a 100 kN/m, external moment rotates the near end "A" of a prismatic beam without translation. What is the value of moment induced at far fixed end "B".

- (a) 50 kNm in opposite direction of applied moment 100 kNm  
 (b) 50 kNm in same direction of applied moment 100 kNm  
 (c) 100 kNm in opposite direction of applied moment 100 kNm  
 (d) 100 kNm in same direction as applied moment 100 kNm

**Ans. (b) :**

$COF = \frac{1}{2}$        $COF = \text{Carryover factor}$

Moment produced at B =  $M \times \frac{1}{2}$   
 $= 100 \times \frac{1}{2} = 50 \text{ kW - m}$   
 [Same direction as 100 kN-m]

26. Due to some point load anywhere on a fixed beam, the maximum free bending moment is M. The sum of fixed end moment is

- (a) M (b) 1.5 M  
(c) 2.0 M (d) 3.0 M

**Ans. (a)**

The maximum free bending moment (M)  
 $= \frac{PL}{4}$

The sum of fixed end moment =  $\frac{PL}{8} + \frac{PL}{8}$   
 $= \frac{PL}{4}$   
 $= M$

27. In slope deflection equations, the deformation are considered to be caused by

- (a) torsion (b) Axial forces  
(c) Shear force (d) Bending moment

**Ans. (d) :** It is assumed that deformation are caused due to bending moment only and axial deformation are neglected.  
 In slope deflection method, established a relationship between degrees of freedom ( $\theta$ ,  $\Delta$ ) member end moment.

28. If in a rigid jointed space frame,  $(6m+r) > 6j$ , where 'j' are the number of joints, 'r' are the number of unknown reactions and 'm' are the number of structural members, then the frame is

- (a) Stable and statically determinate  
 (b) Unstable  
 (c) Stable and statically indeterminate  
 (d) None of the above

**Ans. (c) : In case of space frame-**  
 $6m + r > 6$  denotes that number of unknown forces are more than the equilibrium equation available. Hence structure will be indeterminate & stable.  
 • For stable statically determinate-  $6m + r = 6$   
 • For plane frame  $3m+r = 3J$ , stable statically determinate.

29. At a joint of a frame four members have joined and three of the members have distribution factors for moment distribution as 0.21, 0.29 and 0.35. What is the value of distribution factor for fourth member?

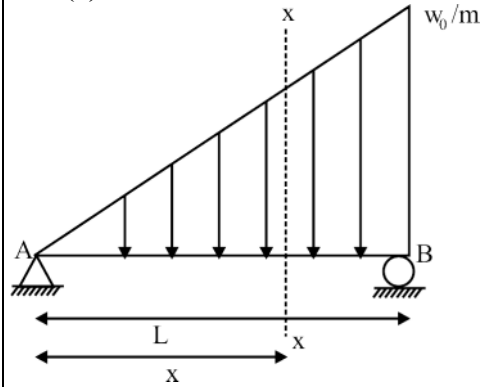
- (a) 0.75 (b) 0.15  
(c) 0.02 (d) 0.25

**Ans. (b) :** Distribution factors for fourth member  
 $\sum df = 1$   
 $0.21 + 0.29 + 0.35 + m_4 = 1$   
 $m_4 = 0.15$

30. A simply supported beam of length L carries a load varying uniformly from zero at left end to maximum at right end. The maximum bending moment occurs at a distance of

- (a) 1/3 from left end  
 (b)  $1/\sqrt{3}$  from left end  
 (c)  $1/\sqrt{3}$  from right end  
 (d) 1/3 from right end

Ans. (b) :



$$R_A + R_B = \frac{1}{2} w_0 L$$

$$\sum M_B = 0 \Rightarrow R_A \times L = \frac{1}{2} w_0 L \times \frac{L}{3}$$

$$R_A = \frac{w_0 L}{6}$$

$$R_B = \frac{w_0 L}{3}$$

At the point of maximum bending moment, Shear force is zero.

$$S.F._{xx} = R_A - \frac{w_0 x^2}{2L} = 0$$

$$\frac{w_0 L}{6} - \frac{w_0 x^2}{2L} = 0$$

$$\frac{w_0 L}{6} = \frac{w_0 x^2}{2L}$$

$$\frac{L}{6} = \frac{x^2}{2L}$$

$$x = \frac{L}{\sqrt{3}} \text{ From A}$$

31. The development length of bars of diameter  $\phi$ , as per IS : 456 : 1978 is given by (where  $\sigma_x$  = stress in bar  $\tau_{bd}$  = design bond stress

- (a)  $4\phi\sigma_s/\tau_{bd}$  (b)  $\phi\sigma_s/4\tau_{bd}$   
 (c)  $2\phi\sigma_s/3\tau_{bd}$  (d)  $\phi\sigma_s/3\tau_{bd}$

Ans. (b) Development length =  $\frac{\phi\sigma_s}{4\tau_{bd}}$

$\phi$  = nominal diameter of the bar.

$\sigma_s$  = stress in bar at the section considered at design load.

$\tau_{bd}$  = design bond stress

32. Which statement is not correct for over reinforced concrete section

- (a) Steel is not fully stressed  
 (b) Neutral axis lies below the neutral axis for balanced section  
 (c) Compressive stress in concrete at extreme fiber reaches its maximum permissible stress value  
 (d) Steel is stressed to its maximum permissible stress

Ans. (d) : Over-reinforced beam contains steel and steel is more ductile than concrete.

• But the behaviour of an under reinforced beam is more ductile than that of over reinforced beam because in under reinforced beam, steel failure first due to the maximum permissible stress of steel reading first.

33. Choose the correct one

- (a) Modular ratio for M 30 concrete is less than M 20 concrete  
 (b) Modular ratio for M 25 concrete is greater than M 20 concrete  
 (c) Modular ratio is same for all grade of concrete  
 (d) As per IS : 456 : 1978, in calculation of modular ratio between elastic moduli of steel and concrete the long term effect such as creep is not taken into consideration

Ans. (a) : Modular ratio –

$$m = \frac{E_s}{E_c} = \frac{E_s}{5000\sqrt{f_{ck}}} \quad \left\{ \begin{array}{l} \text{without considering} \\ \text{creep effect} \end{array} \right\}$$

Modular ratio for M30–

$$m = \frac{2 \times 10^5}{5000\sqrt{30}} = \frac{2 \times 10^5}{5000 \times 5.478} = 7.3$$

Modular ratio for M25–

$$m = \frac{2 \times 10^5}{5000\sqrt{25}} = \frac{2 \times 10^5}{5000 \times 5} = 8$$

Modular ratio for M20–

$$m = \frac{2 \times 10^5}{5000\sqrt{20}} = \frac{2 \times 10^5}{5000 \times 4.47} = 8.94$$

34. A doubly reinforced beam is considered less economical than a singly reinforced beam because

- (a) Concrete is not stressed to full value  
 (b) Tensile steel required is more than that for a balanced section  
 (c) Shear reinforcement is more  
 (d) Compressive steel is under stressed

Ans. (d) : The doubly reinforced beam is less economical than singly reinforced beam because Compressive steel remains under stress in doubly reinforced beam. steel is 10 times costlier than the concrete. The depth reduces but the cost due to steel in compression zone increases.

35. In limit state design, the maximum limit imposed by IS : 456-2000 on the redistribution of moments in statically indeterminate beam is

- (a) 10% (b) 15%  
 (c) 20% (d) 30%

Ans. (d) : According to IS code : 456 :2000 (Clause 37.1.1). The elastic moment at any section in the member due to a particular combination of load shall not be reduced by more than 30% of the elastic maximum moment.

• The ultimate moment of resistance provided at any section of a member is not less than 70% of the moment at that section obtained from an elastic maximum moment diagram. Covering all appropriate combination of load.

36. A reduction factor  $C_r$  to load carrying capacity of a long column is given by

- (a)  $C_r = (1.25 - L_e/24b)$   
 (b)  $C_r = (1.00 - L_e/48b)$   
 (c)  $C_r = (1.25 - L_e/48b)$   
 (d)  $C_r = (1.5 - L_e/48b)$

Ans. (c)  $C_r$  = reduction factor

$$C_r = \left( 1.25 - \frac{L_e}{48b} \right) \text{ or}$$

$$C_r = 1.25 - \frac{l_{\text{eff}}}{160i_{\text{min}}}$$

37. Minimum clear cover (in mm) to the main steel bar in footing column, beam and slab are respectively

- (a) 75,40,25,15 (b) 40,75,15,25  
 (c) 30,20,25,15 (d) 50,40,30,20

Ans. (d) :

Structural Element	Minimum Clear Cover
■ Column	40 mm
■ Slab	20 mm
■ Beam	25 mm
■ Footing	50 mm

38. In prestressed concrete

- (a) Forces of tension and compression change but lever arm remains unchanged  
 (b) Forces of tension and compression remain unchanged but lever arm changes with the moment  
 (c) Both forces of tension and compression and lever arm change  
 (d) Both forces of tension and compression and lever arm remain unchanged

Ans : (b) : In pre-stressed concrete forces of tension and compression remains unchanged but lever arm changes with moment.

39. In design of two-way slab restrained at all edges, torsional reinforcement required is

- (a) 0.75 time the area of steel provided at midspan in the same direction  
 (b) 0.375 time the area of steel provided at midspan in the same direction  
 (c) 0.375 time the area of steel provided at shorter span  
 (d) Not required

Ans. (a) : Torsional reinforcement should be 0.75 times area of steel provided at mid span as per annex D clause D-1.8, of IS 456 : 2000.

- Torsional reinforcement is provided in the form of a grid or mesh both at the top and bottom of the slab.
- $0.75 A_{st}$  if the both the meeting edges are restrained.
- $0.375 A_{st}$  if one of the two meeting edges, one in continuous and other discontinuous.

40. The slump recommended for mass concrete is about

- (a) 20mm to 50 mm  
 (b) 50 mm to 100 mm  
 (c) 100 mm to 125 mm  
 (d) 125 mm to 150 mm

Ans. (a) : Recommended slumps of concrete :

No.	Type of concrete	Slump
1.	Concrete for road construction	20 to 40 mm
2.	Beams and slabs	50 to 100 mm
3.	Mass concrete	25 to 50 mm
4.	Normal RCC works	80 to 150 mm
5.	Impermeable work	75 to 120 mm
6.	Concrete to be vibrated	10 to 20 mm

41. When shear stress exceeds the permissible limit in a slab, then it is reduced by

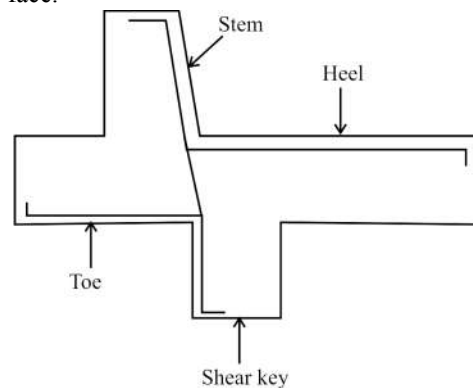
- (a) Decreasing the depth  
 (b) Providing shear reinforcement  
 (c) Using high strength steel  
 (d) Increasing the depth

Ans. (d) : Shear stress in slabs is controlled by increasing the depth of slab and not shear reinforcement while in beams shear stirrups are provided to control shear.

42. In counter fort retaining walls, the main reinforcement in the stem at support is

- (a) Note provided  
 (b) Provided only on inner face  
 (c) Provided only on front face  
 (d) Provided both on inner and front faces

Ans. (b) : In counter fort retaining walls, the main reinforcement in the stem at support is provided only on inner face.



43. Most common method of pre-stressing used for factory production is

- (a) Long line method  
 (b) Freyssinet system  
 (c) Magnet-Blaton system  
 (d) Lee-MaCall system

Ans. (a) : Hoyer's long line method is the system used in pretensioning and the other system like Freyssinet, Gifford Udal, Lee-MaCall and Magnet-Blaton are post-tensioning system.

44. Limit state of serviceability for deflection including the effects due to creep, shrinkage and temperature occurring after erection of partition and application of finishes as applicable to floors and roofs is restricted to

- (a) span/150 (b) span/200  
(c) span/250 (d) span/350

**Ans. (d) :** Limit state of serviceability for deflection including the effects due to creep, shrinkage and temperature occurring after erection of partition and application of finishes as applicable to floors and roofs is restricted to span/350 or 20 mm.

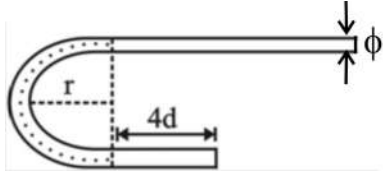
45. For bars in tension, a standard hook has an anchorage value equivalent to a straight length of (where  $\phi$  is diameter of hook)

- (a)  $8\phi$  (b)  $12\phi$   
(c)  $16\phi$  (d)  $24\phi$

**Ans. (c) :** Anchorage values as per IS code 456 : 2000 clause number 26.2.2.1–

**Bend and hooks–**

- The anchorage value of bend shall be taken as 4 times and the diameter of the bar for each  $45^\circ$  bend subjected to maximum of 16 times of diameter of bar.
- The anchorage value of standard U-type hook shall be equal to 16 times of diameter of bar.



46. The channels or angles in the compression chords of the steel truss girder bridges are turned outward in order to increase

- (a) cross-sectional area  
(b) section modulus  
(c) torsional constant  
(d) radius of gyration

**Ans. (d) :** Channels or Angles in the compression chords of the steel truss girder bridges are turned outward in order to increase the radius of gyration which reduces the slenderness ratio of the member. Hence it increases resistance against buckling.

47. Horizontal stiffener in a plate girder is provided to safeguard against

- (a) shear buckling of web plate  
(b) compression buckling of web plate  
(c) yielding  
(d) all of the above

**Ans. (b) :** Horizontal stiffeners in a plate girder is provided to safeguard against compression buckling of web plate. Horizontal stiffeners are also called longitudinal stiffeners.

48. As per IS : 800, the maximum bending moment for design of purlins can be taken as (where W is total distributed load including the wind load on the purlins and E is centre distance of support?)

- (a)  $WL/6$  (b)  $WL/8$

(c)  $WL/10$

(d)  $WL/12$

**Ans : (c) Purlins–**

- It is biaxial bending member
- Maximum spacing between purlin  $\leq 1.4$  m

• Deflection of purlin =  $\frac{\text{span}}{200}$

• Maximum bending moment in the purlin =  $\frac{wL}{10}$

49. Minimum spacing of vertical stiffeners for plate girder is limited to (where 'd' is the distance between flange angles)

- (a)  $d/4$  (b)  $d/3$   
(c)  $d/2$  (d)  $d/6$

**Ans. (b) :** Vertical stiffeners are provided in a spacing of  $0.33d$  to  $1.5d$ , where  $d$  is the distance between the flanges ignoring the fillets.

50. As per IS : 875, for the purpose of specifying basic wind velocity, the country has been divided into

- (a) 4 zones (b) 5 zones  
(c) 6 zones (d) 7 zones

**Ans. (c) :** As per IS 875 (Part 3) for the purposes of specifying. Basic wind velocity the country has been divided into 6 zones.

51. As per IS : 800, for compression flanges, the outstand of flange plates should not exceed, If "t" is thickness of thinnest flange plate

- (a)  $12t$  (b)  $16t$   
(c)  $20t$  (d)  $25t$

**Ans. (b) :** IS : 800, for compression flange, the outstand of flange plates should not exceed  $16t$ .

IS : 800, for tension flange, the outstand of flange plates should not exceed  $20t$ .

52. Intermediate vertical stiffeners in a plate girder need to be provided, if the depth of web exceeds ('t' is thickness of web)

- (a)  $180t$  (b)  $85t$   
(c)  $200t$  (d)  $250t$

**Ans. (b) :** If  $\frac{d}{t_w} < 67 \Rightarrow$  unstiffened girder can be designed i.e. no girder required.

• If  $85 \epsilon < \frac{d}{t_w} < 200 \epsilon \Rightarrow$  Vertical stiffness may be provided ( $C_1$  &  $C_2$ )

• If  $200 \epsilon < \frac{d}{t_w} < 250 \epsilon \Rightarrow$  Vertical stiffener along with longitudinal stiffener at  $0.2d$  may be provided.

• If  $250 \epsilon < \frac{d}{t_w} < 345 \epsilon \Rightarrow$  Vertical stiffeners along with two longitudinal stiffener at  $0.2d$  and  $0.5d$  respectively may be provided

53. The number of seismic zones in which the country has been divided are

- (a) 4 (b) 5  
(c) 6 (d) 7

**Ans. (a) :** As per IS 1893-2002 [Part-1] – India has been divided in to 4 seismic zones.  
 Zone II– Low seismic hazard.  
 Zone III – Moderate seismic hazard  
 Zone IV – Severe seismic hazard.  
 Zone V – Very severe seismic hazard.

- 54. The lacing bars in a steel column should be designed to resist**
- Bending moment due to 2.5% of the column load
  - shear force due to 2.5% of the column load
  - 2.5% of column load only
  - Both 1 and 2

**Ans. (b) :** As per IS 800–1984 clause 5.7.2.1. The lacing of compression members shall be proportioned to resist a total transverse shear ‘V’ equal to at least 2.5% of the axial force in the member.

- 55. Given that the effective area of a tension member is  $A_e$  and the yield stress is  $\sigma_y$ . In order to obtain the ultimate strength of the tension member as per the plastic design concept :  $A_e \sigma_y$  is to be multiplied by**
- 1.3
  - 0.95
  - 0.85
  - 0.75

**Ans. (c) :** The maximum load capacity of tension member is  $0.85 A_e \sigma_y$ .

• The maximum shear capacity of beam column is  $0.55 A_{cs} f_y$ .

The maximum load capacity of compression member is  $1.70 A_e \sigma_{ac}$ .

Where,

$A_e$  = Effective area of the member

$\sigma_y$  = Yield stress

$\sigma_{ac}$  = Allowable compressive stress

$A_{cs}$  = Effective area of the member resisting shear

- 56. Battens provided for a compression member shall be designed to carry a transverse shear equal to**
- 2.5% of axial force in member
  - 5% of axial force in member
  - 10% of axial force in member
  - 20% of axial force in member

**Ans. (a) :** As per IS 800 : 1984, battens shall be designed to carry the bending moment and shear arising from transverse shear force ‘V’ of 2.5% of the total axial force on the whole compression member.

- 57. Shear buckling of web in a plate girder is prevented by using**
- Vertical intermediate stiffener
  - Horizontal stiffener along the neutral axis
  - Bearing stiffener
  - None of the above

**Ans. (a) :** In plate girders, intermediate transverse stiffeners are provided to increase buckling resistance of web in diagonal or shear buckling.

- 58. The thickness of web for unstiffened plate girder with clear distance ‘d’ between the flanges shall not be less than**

- $d/200$
- $d/85$
- $d/100$
- $d/160$

**Ans. (b) :** As per IS 800 : 1984 clause 67.3.1 the thickness of the web plate shall be not less than the

greater of  $\frac{d\sqrt{\tau_{va} \cdot cal}}{816}$  &  $\frac{d\sqrt{6y}}{1344}$  but not less than





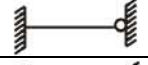
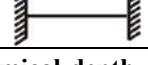
$\frac{d}{85}$  for unstiffened web where d is depth of web.

$\frac{d}{t_w} \leq 85$  then stiffeners are not required.

- 59. The effective length of a structural steel compression of length ‘L’ effectively held in position and restrained against rotation at one end but neither held in position nor restrained against rotation at the other end, is member**

- L
- 1.2 L
- 1.5 L
- 2.0 L

**Ans : (d)** Effective length of prismatic compression member :

	Schematic representation	Effective length
1.		2.0 L
2.		2.0 L
3.		1.0 L
4.		1.2 L
5.		0.8 L
6.		0.65 L

- 60. Economical depth of a plate girder is given by (where M,  $\sigma$ , and  $\tau_w$  are of usual meaning)**

- $\sqrt{(M/\sigma\tau_w)}$
- $1.1\sqrt{(M/\sigma\tau_w)}$
- $1.2\sqrt{(M/\sigma\tau_w)}$
- $1.3\sqrt{(M/\sigma\tau_w)}$

**Ans : (b)** Depth for a plate girder =  $1.1\sqrt{\frac{M}{P \cdot t_w}}$

Guide lines for selecting depth of plate is given below

$\frac{D}{L} = \frac{1}{15}$  to  $\frac{1}{25}$  for girder in building

=  $\frac{1}{12}$  to  $\frac{1}{18}$  for highway bridges

=  $\frac{1}{10}$  to  $\frac{1}{15}$  for railways bridges

61. Shrinkage cracks in masonry could be minimized by

- (a) Avoiding use of rich cement
- (b) Not delaying plaster work till masonry has dried after proper curing
- (c) By using English bond of bricks
- (d) By providing expansion joints

**Ans. (a) :** Strong cement mortar are most likely to lead to shrinkage cracks. Shrinkage cracks in masonry could be minimized by avoiding use of rich cement.

62. Cause of horizontal cracks below RCC slab on top most storey

- (a) Deflection of slab and lifting up of edge of the slab
- (b) Arching of slabs
- (c) Expansion of slab
- (d) All of the above

**Ans. (a) :** Horizontal cracks below slab level occurs due to deflection of a slab and lifting up to the edge of the bearing slab.

• At the same time the horizontal movement in slab due to shrinkage also affect, the horizontal cracks in walls of the top most story below slab level.

63. Which is not correct for high alumina cement

- (a) It can withstand high temperature
- (b) It resist the action of acid
- (c) The initial setting time of this cement is more than 3 hours
- (d) it can be used in mass concrete

**Ans. (d) : High Alumina Cement (IS : 6452-1989)–**

- Bauxite (40%), Limestone (40%), Iron oxide (15%)
- Initial setting time- min. 3 hour 30 minute.
- Final setting time- max. 5 hour.
- It is used for refractory concrete, industries and used widely in pre-casting and very resistance to chemical attack.
- Particularly suitable to sea and under water work.
- Expansion  $\leq 5$  mm.
- It can withstand high temperature
- It resist the action of acid

64. Pulsed Eddy current (PEC) type no destructive test is conducted to find

- (a) Thickness and to detect corrosion on ferrous material
- (b) Compressive strength of concrete used
- (c) Wire bond with concrete
- (d) Permeability of concrete

**Ans. (a) :** Pulsed eddy current (PEC) is an advanced electromagnetic inspection technology used in detecting flaws and corrosion in ferrous materials typically hidden under layers of coating fire proofing or insulation.

65. Modulus of rupture of concrete is a measure of

- (a) compressive strength
- (b) direct tensile strength

- (c) split tensile strength
- (d) flexural tensile strength

**Ans. (d) : Modulus of rupture –**

• It is a measure of the tensile strength it concrete beam or slabs.

• Flexural strength of concrete / bending tensile strength of concrete / modulus of rupture of concrete ( $f_{cr}$ )

$$f_{cr} = 0.7 \times \sqrt{f_{ck}}$$

• The flexural strength of concrete is determined as a modulus of rupture.

66. Compressive strength of brick is

- (a) 4.3 to 6.9 MPa
- (b) 2 to 3 MPa
- (c) 15 to 20 MPa
- (d) 20 to 25 MPa

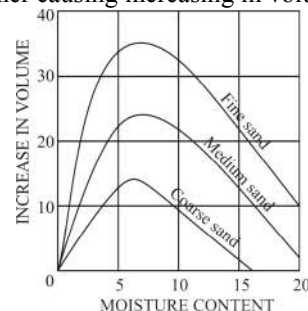
**Ans. (a) :** The minimum crushing/compressive strengths of burnt bricks tested flat-wise prescribed are:

- (i) Common building bricks 3.5 MPa,
- (ii) Second class bricks 7 MPa
- (iii) First class bricks 10.5 MPa.

67. Bulking of sand is maximum if moisture content is about

- (a) 2%
- (b) 3%
- (c) 4%
- (d) 5%

**Ans. (d) :** Bulking of sand or fine aggregate is the phenomenon of increase in sand volume due to the increase of moisture content. The moisture content in the sand makes thin films around sand particles. Hence, each particle exerts pressure. Thus they move away from each other causing increasing in volume.



The increase in the volume of given mass of fine aggregate caused by the presence of water is known as bulking of sand. The extent of bulking depends upon the percentage of moisture present in sand and its fineness, with ordinary sand bulking varies from 25-40 percent. It increases with moisture content up to a certain point (4-6%) reaches maximum.

68. for a given aggregate content, increasing water-cement ratio in concrete it

- (a) Decrease shrinkage
- (b) Increases shrinkage
- (c) Does not change shrinkage
- (d) None of the above

**Ans. (b) :** The water-cement ratio is the ratio of the weight of water to the weight of cement used in a concrete mix.

• A lower ratio leads to higher strength and durability, but may make the mix difficult to work with and forms.

- A mix with too much water will experience more shrinkage as excess water leaves, resulting in internal cracks and visible fractures (particularly around inside corner), which again will reduce the final strength and durability.

69. The approximate ratio between the strength of cement concrete at 7 days and 28 days is

- (a) 3/4 (b) 2/3  
(c) 1/2 (d) 1/3

Ans. (b) :

Age of cement	Age factor for low strength concrete
7 days	0.65 – 0.7
1 month	1.0
3 months	1.1
12 months	1.2

$$\frac{\text{Strength of concrete at 7 days}}{\text{Strength of concrete at 28 days}} = \frac{2}{3} = 0.67$$

70. Sum of tread and rise (in mm) for a staircase must lie between

- (a) 300 to 350 (b) 400 to 450  
(c) 500 to 550 (d) 600 to 650

Ans. (b) : Sum of tread and rise must lie between 400 mm to 450 mm.

Some thumb rule of sum of tread and rise

- (i)  $2R + T = 60$  cm  
(ii)  $R + T = 40$  to 45 cm  
(iii)  $R \times T = (400 \text{ to } 450)$  cm

Where R = Rise in cm  
T = Tread in cm

71. In c concrete mix the fineness modulus of coarse aggregate is 7.6, the fineness modulus of the aggregate is 2.8 and economical value of the fineness modulus of combined aggregate is 6.4, then the proportion of fine aggregate is

- (a) 66.67% (b) 25%  
(c) 50% (d) 33.33%

Ans. (d) : Given,

Fineness modulus of coarse aggregate = 7.6

Fineness modulus of fine aggregate = 2.8

Fineness modulus of combined aggregate = 6.4

$$\frac{F_{\text{coarse}} - F_{\text{comb}}}{F_{\text{comb}} - F_{\text{fine}}} \times 100$$

$$\frac{7.6 - 6.4}{6.4 - 2.8} \times 100 = \frac{1.2}{3.6} \times 100$$

33.33%

72. To make one cube meter of 1 : 2 : 4 by volume concrete, the volume of coarse aggregate required is

- (a) 0.85 m<sup>3</sup> (b) 0.95 m<sup>3</sup>  
(c) 0.90 m<sup>3</sup> (d) 0.75 m<sup>3</sup>

Ans. (a) : 1 m<sup>3</sup> of dry concrete = 1.52 m<sup>3</sup> of wet concrete

M15 = 1:2:4 = 1 + 2 + 4 = 7

$$\frac{\text{Dry volume of concrete}}{\text{Wet volume of concrete}} = 1.52$$

$$\text{Volume of cement} = 1.52 \times \frac{1}{7} m^3$$

$$\text{Volume of cement} = 0.22 m^3$$

$$\text{Volume of sand} = 1.54 \times \frac{2}{7} = 0.44 m^3$$

$$\text{Volume of aggregate} = 1.54 \times \frac{4}{7} = 0.86 m^3 \therefore 0.85 m^3$$

73. The role of super plasticizer in a cement paste is to

- (a) disperse the particle  
(b) disperse the particle and to remove the air bubbles  
(c) Retard setting  
(d) Disperse the particle and to remove the air bubbles and to retard setting

Ans. (d) : Super-plasticizer – They are admixtures that work on surfactant properties, in which they disperse and deflocculate cement particles thus making concrete flowing pourable and easily placed.

74. Choose the most correct statement with regard to Queen closer

- (a) Brick laid with its breadth parallel to the face or direction of wall  
(b) Brick having the same length and depth as the other bricks but half the breadth  
(c) Brick with half the width at one end and full width at the other  
(d) To break the continuity of vertical joints and to provide proper bond in brick masonry work

Ans. (b) : When the bricks is cut along the length it is called queen closer.

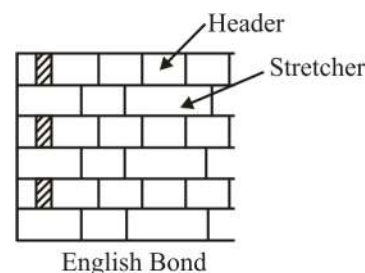
- When the bricks is cut at one end by half header and half stretcher, it is known as king closer.

75. The type of bond provided in brick masonry for carrying load is

- (a) English bond  
(b) Single flemish bond  
(c) Double flemish bond  
(d) Zigzag bond

Ans. (a) For the load bearing brick wall, the English bond is provided.

- English bond in brick masonry has one course of stretcher only and a course of header above it. Header are laid centered on the stretchers in course below and each alternate row is vertically aligned.





76. Which of the following is a weakness of bar chart

- (a) Interdependencies of activities
- (b) Project progress
- (c) Time Uncertainties
- (d) All of the above

**Ans. (d) : Limitation of bar chart–**

1. Lack of degree of details
2. Does not show project progress
3. Does not show activity inter-relationship
4. Time uncertainties
5. It does not indicate the critical activities of the project.
6. No cost optimization.

77. The earthwork quantities are calculated

- (a) By mid-sectional method
- (b) By mean sectional method
- (c) By prismatic method
- (d) All of the above methods

**Ans. (d) :** The earthwork quantities can be calculated by:

- Mid-section method.
- Mean-sectional method.
- Prismatic method.

78. In 1.0 cubic meter of 1 : 2 : 4 cement concrete, how many bags of cement (approximately is required)?

- (a) 6.6
- (b) 16.6
- (c) 26.6
- (d) 36.6

**Ans. (a) :** Given 1 : 2 : 4

The sum of ratio = 7

One cu.m. volume of wet cement concrete = 1.54 m<sup>3</sup>

1) Quantity of cement in one cu.m. concrete =

$$\frac{1.54 \times 1}{7} = 0.22 \text{ m}^3$$

2) In kg =  $0.22 \times 1440 \text{ cum} \times \frac{\text{kg}}{\text{cum}} = 316.8 \text{ kg}$

3) In bags =  $\frac{316.8}{50} = 6.3 \text{ bags} \approx 6.6 \text{ bags}$

79. The detailed estimate of the cost of the project is done by

- (a) Unit quantity method
- (b) Total quantity method
- (c) BOQ method
- (d) By first two methods

**Ans. (b) :** Detailed estimate is done by total quantity method.

- Detailed estimates are prepared by carefully and separately calculating in detail the costs of various items of the work that continue the whole project.

80. In the time-cost optimization, using CPM method for network analysis, the crashing of the activities along the critical path is done starting with the activity having

- (a) shortest duration
- (b) least cost slope

- (c) longest duration
- (d) highest cost slope

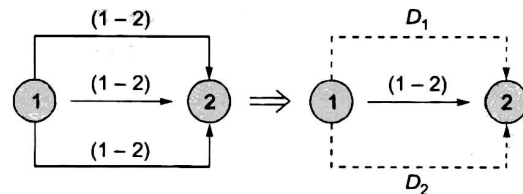
**Ans. (b) :** In the time-cost optimization, using CPM method for network analysis, the crashing of the activities along the critical path is done starting with the activity having least cost slope .

- The objective of time cost optimisation is to determine optimum project duration corresponding to the minimum total cost.

81. There are three parallel paths in a part of a network between a bursting node and the next merging node with only one activity in each path. The minimum number of dummy arrows needed will be

- (a) 3
- (b) 2
- (c) 1
- (d) 0

**Ans. (b) :** Certain activities that neither consume time nor resources, but are used simply to represent a connection or a link between events are known as dummies.



2 dummy arrows to correctly represent the networks

82. In long wall and short wall method of estimation which one of the following is correct

- (a) short wall length in to in = centre to centre length - one breadth
- (b) short wall length in to in = centre to centre length + one breadth
- (c) Long wall length out to out = centre to centre length + one breadth
- (d) Long wall length out to out = centre to centre length - two breadth

**Ans. (a & c) : Long wall – Short wall method–**In this method, the wall along the length of room is considered to be long wall while the wall perpendicular to long wall is said to be short wall.

To get the length of long wall or short wall, calculate first the centre line lengths of individual walls.

83. The direct cost of a project with respect to normal time is

- (a) minimum
- (b) maximum
- (c) zero
- (d) infinite

**Ans. (a) : Direct cost:-**

Direct cost include the cost of materials, labour equipment etc. direct cost of a project reduces with time

84. if the optimistic time, most likely time and pessimistic time for activity x are 10, 18 and 20 respectively and for activity b are 12, 18 and 30 respectively, then

- (a) expected time of activity x is greatest than the expected time of activity y
- (b) expected time of activity y is greatest than the expected time of activity x
- (c) expected time of activity x is same as that the expected time of activity y
- (d) none of the above is correct

**Ans. (b) :**  $t_c = \frac{t_0 + 4t_m + t_p}{6}$

For X  $\rightarrow t_c = \frac{10 + 4 \times 18 + 20}{6} = 17$

For Y  $\rightarrow t_c = \frac{12 + 4 \times 18 + 30}{6} = 19$

Expected time of activity Y is greater than the expected time of activity X.

**85. Slack time refers to**

- (a) an activity
- (b) an event
- (c) both event and activity
- (d) critical event only

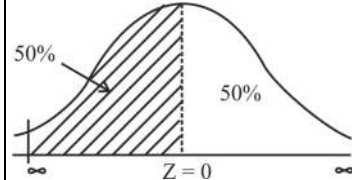
**Ans. (b) : Slack**—The difference between the two times of an activity indicates the range between which the occurrence time of an event can vary.

• Slack may be simply defined as the difference between the latest allowable time and the earliest expected time of an event.

**86. The probability of completion of any activity within its expected time is**

- (a) 50%
- (b) 81.1%
- (c) 67%
- (d) 100%

**Ans : (a)** In PERT analysis the probability of completion of any activity within its expected time is 50% whereas in CPM it is 100%



**87. The PERT calculations yield a project length of 75 weeks, with a variance of 9. Within how many weeks would you expect the project to be completed with probability of 95%, Take probability factor Z equal to 1.65 for 95% probability 54.95 56.6 60 79.95**

- (a) 54.95
- (b) 56.6
- (c) 60
- (d) 79.95

**Ans. (d) :** Given  $\sigma^2 = 9$ , so  $\sigma = 3$ ,  $T_E = 75$  weeks

$$Z = \frac{T_s - T_E}{\sigma} \Rightarrow T_s = T_E + Z\sigma$$

$$= 75 + 1.65 \times 3$$

$$T_{95\%} = 79.95 \text{ weeks.}$$

**88. In analysis of rates which is/are included from the following**

- (a) cost of quantities of materials
- (b) cost of labour and other miscellaneous expenditures

- (c) character's profit
- (d) all of the above

**Ans. (d) :** Rate analysis include :

1. Cost of labour wages.
2. Cost of material.
3. Overhead charges.
4. Location of site.
5. Contractor profit.

**89. Cost slope**

- (a) (Crash cost – normal cost) / crash time
- (b) Crash cost / (normal cost – crash time)
- (c) (Crash cost – normal cost) / normal time
- (d) (Crash cost – normal cost / normal time – crash time)

**Ans. (d) : Cost slope :**

It is given by difference between crash cost and normal cost divided by difference between crash time and normal time.

$$\text{Cost Slope} = \left( \frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}} \right)$$

$$\text{Cost Slope} = \frac{C_c - C_n}{t_n - t_c} = \frac{\Delta c}{\Delta t}$$

**90. Free float is mainly used to**

- (a) identify the activities which can be delayed without affecting the total float of preceding activity
- (b) identify the activities which can be delayed without affecting the total float of succeeding activity
- (c) Establish priorities
- (d) identify the activities which can be delayed without affecting the total float of either of preceding or succeeding activities

**Ans. (b) : Free float**—Free float is that portion of positive total float that can be used by an activity without delaying any succeeding activity (or without affecting) the total float of the succeeding activity.

• The concept of free float is based on the possibility, that all the events occur at their earliest time.

**91. The line of action of the buoyancy force acts through the**

- (a) Centre of gravity of the submerged body
- (b) Centroid of the volume of any floating body
- (c) Centroid of the displaced volume of fluid
- (d) Centroid of the volume of fluid vertically above the body

**Ans. (c) : Buoyancy** – When a body is immersed in a fluid either wholly or partially, it is buoyed up by a force, which is equal to the weight of fluid displaced by the body.

• The point of application of the force of buoyancy on the body is known as the centre of buoyancy. It is always the centre of gravity of the volume of fluid displaced.

**92. Choose the correct statement**

- (a) Standard project flood (SPF) is always greater than probable maximum flood (PMF)
- (b) PMF > SPF
- (c) The catchment characteristics decides whether PMF is greater than SPF
- (d) PMF = SPF

**Ans. (b) : Standard project flood (SPF)–**

• The flood that would result from a severe combination of meteorological and hydrological factors that are reasonably applicable to the region.

Extremely rare combinations of factors are excluded.

**Probable maximum flood (DMF)–**

• The extreme flood that is physically possible in a region as a result of severest combination, included rare combination of meteorological and hydrological factors.

$$PMF > SPF$$

**93. What is the limitation of rational formula for flood peak estimation?**

- (a) Duration of rainfall intensity should be less than the time of concentration
- (b) Rainfall intensity must be constant over the entire watershed during the 90% time of rainfall duration
- (c) It gives base of hydrograph but not the peak of hydrograph
- (d) Formula is application to watershed area up to 50 square kilometers

**Ans. (d) : Rational method–**

The peak value of runoff by rational formula is given by–

$$Q_p = \frac{1}{3.6} CiA$$

C = Coefficient of runoff

Q<sub>p</sub> = Peak discharge (m<sup>3</sup>/sec)

i = Mean intensity of precipitation (mm/h)

A = Drainage area in km<sup>2</sup>.

• The rational formula is found to be suitable for peak flow prediction in small catchments up to 50 km<sup>2</sup> in area.

• It finds considerable application in urban drainage design and in the designs of small culvert and bridges.

**94. Why in flood routing the peak of outflow hydrograph is less than the peak of inflow hydrograph**

- (a) As the velocity of flood wave increases with time
- (b) due to the effect of storage and channel friction
- (c) As the outflow hydrograph contains more volume of water than inflow hydrograph
- (d) As the time base of the outflow hydrograph reduces.

**Ans. (b) :** Owing to the storage effect, the peak of the outflow hydrograph will be smaller than that of the inflow hydrograph. This reduction in the peak value is

called attention. Further, the peak of the outflow occurs after the peak of inflow; the time differences between the two peaks known as lag.

• The storage capacity of the reservoir and the characteristic of spillways and other outlet control the lag and attenuation of an inflow hydrograph.

**95. In sequent peak method for calculating reservoir capacity, which one of the following is the correct statement.**

- (a) The difference between the first peak and the trough following it is the reservoir storage required under normal condition
- (b) Cumulative inflow volume is plotted in Y-axis against time in X-axis
- (c) The cumulative difference of inflow and demand is plotted in Y-axis against cumulative inflow in X-axis
- (d) The difference in summation of trough gives storage required under normal inflows

**Ans. (c) : Sequent peak method–** The mass curve method is widely used for the analysis of reservoirs capacity demand problems.

• Sequent peak algorithm is particularly suitable for the analysis of large data with help of computer.

• Sequent peak algorithm is particularly suitable for the analysis of large data with help of computer.

• The surplus or deficit of storage in that period is the net flow volume given by

$$\text{Net flow volume} = \text{Inflow volume} - \text{Outflow volume}$$

• In the sequent peak algorithm a mass curve of cumulative net flow volume against chronological time is used this curve known as residual mass curve.

**96. In Newton formulation the law of fluid friction**

- (a) Shear stress is proportional to shear stress
- (b) Shear stress is inversely proportional to shear stress
- (c) Shear stress is proportional to shear strain
- (d) Shear stress is proportional to rate of shear strain

**Ans. (d) : Newton's law of viscosity –**

For Newtonian Fluid shear stress (τ)

$$\tau \propto \frac{dv}{dy} \text{ (velocity gradient)}$$

$$\tau = \mu \frac{dv}{dy} \quad \mu = \text{dynamic viscosity}$$

• For Newtonian fluid, coefficient of viscosity remain constant.

Example of Newtonian fluid water, alcohol, petrol, air etc.

**97. An object weight 289.9 N in air and 186.9 N in water. What is the relative density of the material of the object?**

- (a) 2.83
- (b) 2.45
- (c) 2.15
- (d) 2.00

**Ans. (a) :** Weight in water = 186.9 N

Weight in air = 289.9 N

W<sub>FB</sub> = 186.9

$$FB = 289.9 - 186.9 = 103$$

$$V \times \rho_w \times g = 103$$

$$\text{Volume of body (V)} = \frac{103}{\rho_w g}$$

$$\therefore W = 289.9$$

$$V \rho g = 289.9$$

$$\frac{103}{\rho_w g} \times \rho g = 289.9$$

$$\text{Specific gravity} = \frac{\rho}{\rho_w} = 2.81$$

98. The pressure 44.1 kPa is equivalent to
- 5.94 m of water
  - 0.33 m of mercury
  - 154.84 kN/m<sup>2</sup> absolute
  - 15.84 m of water absolute

**Ans. (b) :** Given,  
pressure (P) = 44.1 kPa  
 $P = \rho gh$

$$h = \frac{44.1 \times 10^3}{9.81 \times 1000} = 4.4 \text{ m of water}$$

Taking mercury, then

$$h = \frac{4.49}{13.6} = 0.33 \text{ m of mercury}$$

99. Choose the correct value of friction factor (f) of the circular pipe for the laminar flow eight Reynold's number 640
- 0.1
  - 0.15
  - 0.20
  - 0.25

**Ans. (a) :** For laminar flow–

$$\text{Friction factor (f)} = \frac{64}{R_e}$$

$$f = \frac{64}{640} = 0.1$$

100. In supercritical open channel flow
- The critical depth is always above normal depth
  - The critical depth and normal depth merges
  - Critical depth is always below the normal depth
  - Insufficient information for any comment

**Ans. (a) : Super critical flow–** Depth of flow less than critical depth resulting from relatively steep slopes.

- Fraud number is greater than one.
- Flow of this type is most common in steep streams.

101. The differential gauge attached to pitot tube shows 76 mm deflection of mercury, when the placed against the flow direction of water in the river. What is the value of velocity of river water?
- 3.444 m/s
  - 4.17 m/s
  - 2.87 m/s
  - 4.19 m/s

**Ans. (\*) : Velocity of river is given by–**

$$v = \sqrt{2gh}$$

$$h = y \left( \frac{S_m}{S} - 1 \right)$$

$$h = 76 \left( \frac{13.6}{1} - 1 \right) = 957.6 \text{ mm} = 0.9576 \text{ m}$$

$$v = \sqrt{2 \times 9.81 \times 0.9576} = 4.33 \text{ m/s}$$

102. The main function of a divide wall is to
- Control the silt entry in the canal
  - Prevent river floods from entering the canal
  - Separate the under sluices from weir proper
  - Provide smooth flow at sufficiently low velocity

**Ans. (c) : Divide wall–** A divide wall is masonry or concrete wall constructed at right angles to the axis of the weir or barrage.

- It separates the weir bays the under-sluices portion.
- The top width of the divide wall is kept 1.5 to 2.5 m.

103. The hydraulic mean depth laid at an longitudinal slope of 0.004 is 0.837. What is the minimum size of stone that will remain at rest?
- 3.70 cm
  - 4.50 cm
  - 5.30 cm
  - 6.45 cm

**Ans. (a) :** Hydraulic mean depth (R) = 0.837 m  
Longitudinal slope (S<sub>0</sub>) = 0.004  
Minimum size of stone = 11 × R × S<sub>0</sub>  
= 11 × 0.837 × 0.004  
= 0.0368 m  
= 3.68 cm

104. The rainfall in four successive 12 hours period on a catchment are 40, 80, 90 and 30 mm. If the infiltration index for the soil is 5 mm/hr, then the total surface run off will be
- 0
  - 50 mm
  - 120 mm
  - 180 mm

**Ans. (b) :**  $Q = \frac{P - R}{t}$

Only value above 5 mm/hr consider only calculation of runoff (mean  $\frac{40}{12}$  mm/hr and  $\frac{30}{12}$  mm/hr excluded)

$$Q = \frac{(80 + 90) - R}{12 + 12}$$

$$5 = \frac{(80 + 90) - R}{24}$$

$$120 = 170 - R$$

$$R = 170 - 120$$

$$R = 50 \text{ mm}$$

105. A confined aquifer 2.0 km wide discharges 0.06m<sup>3</sup>/day/km to a dry river in the month of April. What is the value of transmissivity of aquifer, if the slope of the piezometric surface is 0.375 m/km

- (a) 0.08 m<sup>2</sup>/day (b) 0.16 m<sup>2</sup>/day  
(c) 0.32 m<sup>2</sup>/day (d) 0.04 m<sup>2</sup>/day

**Ans. (b) :**  $Q = kiA$

$$Q = ki (B \times L)$$

$$\left(\frac{Q}{B}\right) = kiL$$

$$0.06 = k \times 0.375 \times 2$$

$$k = 0.08 \text{ m/day}$$

Transmissivity

$$T = kB$$

$$T = 0.08 \times 2$$

$$T = 0.16 \text{ m}^2/\text{day}$$

**106. The non-scouring limiting velocity (in m/s) for cement concrete sewers is**

- (a) 4.5 to 5.5 (b) 3.5 to 4.5  
(c) 3.0 to 4.0 (d) 2.5 to 3.0

**Ans. (d) : Non-scouring velocity**– The maximum permissible velocity at which no such scouring action will occur is known as non-scouring velocity and it will mainly depend on the material used in the constructed of sewers.

• The non scouring velocity for cement concrete sewer lies between 2.5 to 3.0 m/sec.

**107. The dissolved oxygen level in natural unpolluted waters at normal temperature is found to be of the order of**

- (a) 1 mg/litre (b) 10 mg/litre  
(c) 100 mg/litre (d) 1000 mg/litre

**Ans. (b) :** It is the maximum quantity of DO that can remain in water at a particular temperature. Hence at normal temperature, DO content is nearly 10 mg/ℓ d

**108. For a given discharge, the efficiency of sedimentation tank can be increased by**

- (a) Decreasing surface area of the tank  
(b) Increasing the depth of the tank  
(c) Decreasing the design of the tank  
(d) Increasing surface area of the tank

**Ans. (d) :** The efficiency of the sedimentation tank increase is the verflow rate reduces (more time available

to particles for settle) overflow rate  $(V_3) = \frac{Q}{B \times L}$

• For the equation, it is clear that if the surface area (B×L) of the tank increase the overflow rate reduces, and efficiency increases for a given discharge.

**109. The process in which the chlorination is done beyond the break point is known as**

- (a) Pre chlorination  
(b) Post chlorination  
(c) Break point chlorination  
(d) Super chlorination

**Ans. (d) : Super chlorination**– When excess chlorine (5 to 15 mg/ℓ) is added during an epidemic such that it gives a residual at 1 to 2 mg/ℓ beyond break point is called super chlorination.

• It is most commonly added at the end of filtration.

**110. Select the correct statement**

- (a) 5 day BOD is the ultimate BOD  
(b) 5 day BOD is greater than 4 day BOD keeping other conditions same  
(c) BOD does not depend on time  
(d) 5 day BOD is less than 4 day BOD keeping other condition same

**Ans. (b) : BOD (Biochemical oxygen demand)**–

• It is the amount of oxygen required for the decomposition if biodegradable organic matter present in the system.

• BOD during 5 days at 20<sup>0</sup>C is taken as standard BOD and is approximately 0.8% of the ultimate BOD.

• 5 Day BOD is greater than 4 day BOD is keeping other conditions same.

**111. The working condition of imhoff tanks are**

- (a) Aerobic only  
(b) Anaerobic only  
(c) Aerobic in lower compartment and aerobic in lower  
(d) Anaerobic in lower compartment and aerobic in upper compartment

**Ans : (d)** An Imhoff tank is an improvement over septic tank, in which the incoming sewage is not allowed to get mixed up with the sludge produced, and the outgoing effluent is to allowed to carry with it large amount of organic load as in the case of a septic tank. An Imhoff tank is, in fact, at two storeyed tank. They are sometimes also known as Two-storey Digestion tanks.

**112. Sludge volume index is defined as the ratio of**

- (a) Percentage of sludge by volume to percentage of suspended solids by weight  
(b) Percentage of sludge by volume of percentage total solids by weights  
(c) Percentage of suspended solids by weight to percentage of sludge by volume  
(d) Percentage of total solids by weight to percentage of sludge by volume

**Ans. (a) :** Sludge volume index 'SVI' =

$$\frac{\text{Percentage of sludge by volume}}{\text{percentage of suspended solids by weight}}$$

• Sludge volume index is the volume occupied in mL by one gm of solids in mixed liquor after setting for 30 minutes.

**113. In the two pipe system of house plumbing, the pipes required are**

- (a) One soil pipe, one waste pipe and one vent pipe  
(b) One soil pipe, two waste pipe and one vent pipe  
(c) One soil pipe, one waste pipe and two vent pipe  
(d) Two soil pipe, one waste pipe and one vent pipe

**Ans. (c) : Two pipe system**– This is the most common system used in India.

- This method provided an ideal solution, where it is not possible to fix the fixtures closely.
- One pipe collect the foul soil and water closet wastes and the second pipe collects the water from kitchen, bathrooms, house washings etc.
- The soil pipes are directly connected to the manhole/drain, where as the waste pipes are connected through fully ventilated gully trap.

**114. Select the primary air pollutants among the following :**

- Sulphur dioxide and nitrogen oxides
- Ozone and carbon monoxide
- Sulphur dioxide and ozone
- Nitrogen and ozone

**Ans. (a) : Primary pollutant**– A primary pollutant is an air pollutant emitted directly from a source.

- Ex Carbon Monoxide (CO), Sulphur dioxide and nitrogen oxides etc.

**115. When Environmental Lapse Rate (ELR) is more than Adiabatic Lapse Rate (ALR), then the environment is said to be**

- Stable
- Unstable
- Neutral
- None of the above

**Ans. (b) :** When Environmental Lapse Rate (ELR) is more than adiabatic Lapse Rate (ALR), then the environment is said to be unstable-

$$E.L.R > A.L.R = \text{Unstable}$$

$$E.L.R < A.L.R = \text{Stable}$$

$$E.L.R = A.L.R = \text{Neutral}$$

**Lapse rate**– In the troposphere, the temperature of the ambient (surrounding) air normally decreases with increases in the altitude (height). This rate of change of temperature is called lapse rate.

**116. Two samples of water X and Y have pH values of 4.4 and 6.4 respectively. How many times more acidic sample X is than sample Y?**

- 0
- 50
- 100
- 1000

**Ans. (c) :**  $pH = -\log [H^+]$

$[H^+] = \text{Concentration in moles/litre}$

For sample A

$$4.4 = -\log [H^+]$$

$$[H^+] = 3.98 \times 10^{-5} \text{ moles/litre}$$

For sample 'B'–

$$6.4 = -\log [H^+]$$

$$[H^+] = 3.98 \times 10^{-7} \text{ moles/litre}$$

$$\frac{[H^+] \text{ of sample A}}{[H^+] \text{ of sample B}} = \frac{3.98 \times 10^{-5}}{3.98 \times 10^{-7}} = 100$$

100 times more acidic sample X is than sample Y

**137. Fresh sludge has moisture content 99% and after thickening, its moisture content reduces to 96%. The reduction in volume of sludge is**

- 3%
- 5%
- 75%
- 97.5%

**Ans. (c) :**  $V_1(100 - P) = V(100 - P)$

$$\frac{V_1}{V} = \frac{100 - 99}{100 - 96} = \frac{1}{4} = 0.25$$

$$\text{Volume reduction (in \%)} = \frac{V - V_1}{V} \times 100$$

$$= \left(1 - \frac{V_1}{V}\right) \times 100 \Rightarrow (1 - 0.25) \times 100$$

$$= 75\%$$

**118. Aerosol is**

- Carbon particles of microscopic size
- Dispersion of small solids or liquid particles in gaseous media
- Finely divided particles of ash
- Diffused liquid particles

**Ans. (b) : Aerosols**– Aerosols refer to the dispersion of solid or liquid particles of microscopic size in gaseous media, such as dust, smoke, of mist.

**119. A city supply of 15000 cubic meter of water per day is treated with a chlorine dosages of 0.5 ppm. For this purpose, the requirement of 25% bleaching powder per day would be**

- 300 kg
- 75 kg
- 30 kg
- 7.5 kg

**Ans. (c) :**

Chlorine required for the city = Does  $\times$  Discharge

$$= 0.5 \times \frac{15000 \times 10^3}{10^6} = 7.5 \text{ kg/day}$$

$$\text{Bleaching powder required} = \frac{7.5}{0.25} = 30 \text{ kg/day}$$

**120. The detention period for oxidation ponds are usually kept as**

- 4 to 8 hrs
- 24 hrs
- 10 to 15 days
- 3 months

**Ans. (c) :** Oxidation ponds–

(i) Depth = 1 m to 1.8 m

Detention period = 10 to 15 day.

Organic loading = 150 to 300 kg/hour/day

**121. The type of footing which is used to transmit heavy loads through steel column is**

- Raft foundation
- Grillage foundation
- Well foundation
- Isolated foundation

**Ans. (b) : Grillage foundation** – This type of foundation is found suitable when load transmitted by a column of a wall is exceptionally heavy and bearing capacity of the soil is very low.

**Raft foundation**– It is used in those place where the heavy concentrated loads of the structures are to be distributed over the whole floor area.

122. Under a given load, a clay layer attains 30% degree of consolidation in 1000 days. The taken by the same clay layer to attain 60% degree of consolidation will be (in days)

- (a) 1600 (b) 400  
(c) 800 (d) 200

Ans. (b) : Time factor,  $T_v = \frac{\pi}{4} \times u^2$  (IS 4 ≤ 60%)

Where,  $u$  = degree of consolidation,  
 $C_v$  = Coefficient of consolidation  
 $d$  = length of drainage  
 $t$  = time taken for consolidation

Equal (i) and (ii)

$$\frac{\pi}{4} 4^2 = \frac{C_v t}{d^2}$$

$$4 = \sqrt{\frac{4 C_v t}{\pi d^2}}$$

For a given  $C_v$  and  $d$

$$u \propto \sqrt{t}$$

$$\frac{u_1}{u_2} = \sqrt{\frac{t_1}{t_2}} \Rightarrow \frac{30}{60} = \sqrt{\frac{1000}{t_2}}$$

$$t_2 = 400 \text{ day}$$

123. At a site having a deposit of dry sandy soil, an average soil of standard penetration resistance  $N$  equal to 6 was recorded. The compactness of the soil deposit can be described as

- (a) Loose (b) Dense  
(c) Medium (d) Very loose

Ans. (a) : Standard Penetration Resistance – (IS-2131)

- Used for determining relative density/ density index
- Angle of shearing resistance
- Unconfined compressive strength
- Pile load capacity
- Ultimate bearing capacity on the basis of shear centre
- Allowable bearing pressures on the basis of settlement criteria
- Test suitable for medium and dense sand

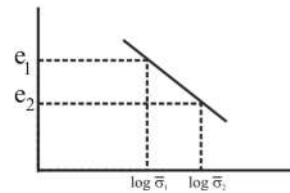
SPT Value	Relative Density of consistency	$\phi$ (in °)
0-4	Very loose	<30
5-10	Loose	30°-35°
11-30	Medium dense	35-38
31-50	Dense	38-41°
>50	Very Dense	41-44°

\* Above table confirms to IS : 2911-1-2

124. The slope of the  $e$ -log  $p$  curve for a soil mass gives

- (a) Coefficient of consolidation,  $C_v$   
(b) Coefficient of permeability,  $k$   
(c) Coefficient of volume compressibility,  $m_v$   
(d) Compressive index,  $C_c$

Ans. (d) : Coefficient of compression/compression index ( $C_c$ )–



$$C_c = \frac{\Delta e}{\log \frac{\sigma_2}{\sigma_1}}$$

$$C_c = \frac{e_1 - e_2}{\log_{10} \frac{\sigma_2}{\sigma_1}}$$

$$C_c = \frac{e_1 - e_2}{\log_{10} \left( \frac{\sigma_2}{\sigma_1} \right)}$$

125. The soils most susceptible to liquefaction are

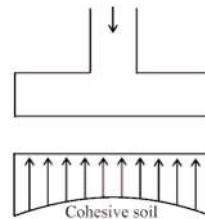
- (a) Saturated gavels and cobbles  
(b) Saturated clays of uniform size  
(c) Saturated dense sands  
(d) Saturated fine and medium sands of uniform particle size

Ans. (d) : Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. The phenomenon is most often observed in saturated, loose (low density or un-compacted), sandy soils. This is because a loose sand has a tendency to compress when a load is applied.

126. Contact pressure beneath a rigid footing resting on cohesive soil is

- (a) More at edge compared to middle  
(b) Uniform throughout  
(c) Less at edges compared to middle  
(d) Zero at edges and maximum at middle

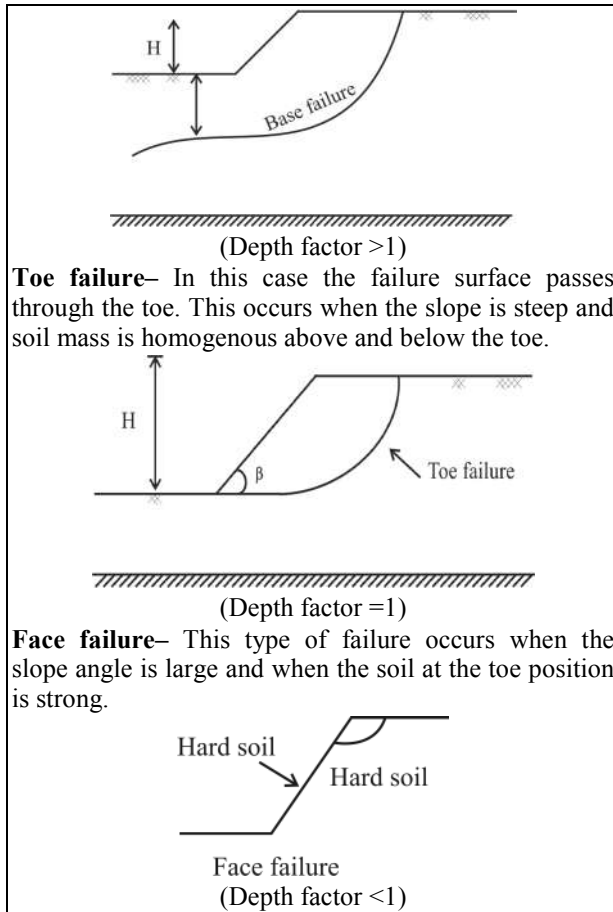
Ans. (a) : Rigid footing on clayey soil has constant settlement and variable pressure. Its pressure is more at edge and lower at center.



127. For a base failure, the depth factor  $D_f$  is

- (a)  $D_f = 1.0$   
(b)  $D_f > 1.0$   
(c)  $D_f < 1.0$   
(d) 0

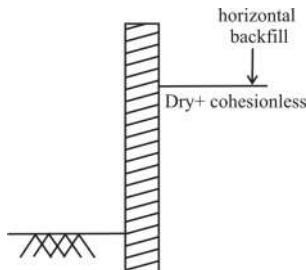
Ans. (b) : Base failure– In this case the failure surface passes below the toe. This generally occurs when the soil below the toe is relatively soft and weak in comparison to soil mass above the toe.



**128. Cohesive soils are**

- (a) Good for backfill because of large lateral pressure
- (b) Good for backfill because of high lateral pressure
- (c) Poor for granular in nature and drains water quickly
- (d) Poor for backfill because of large lateral pressure

**Ans. (d) :** Cohesive soils are- poor for backfill due to large lateral pressure on wall and their swelling characteristics.



As per Rankine's theory value of  $k_0$  for various soil are as tabulated below

	Soil type	$K_0$
1	For dense sand	0.9-0.5
2	Loose sand	0.45-0.5
3	Mechanically compacted sand	0.8-1.0

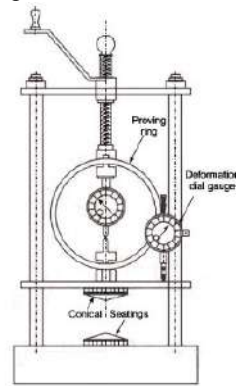
4	N.C & clay	0-5 to 0.6
5	O.C clay	1.0-4.0

**129. Select the incorrect statement**

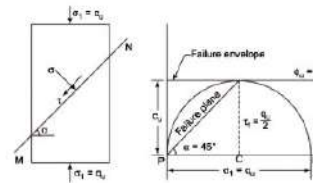
- (a) Unconfined compression test can be carried out on all types of soils
- (b) Stress distribution on the failure plane in the case of triaxial compression test is uniform
- (c) In a direct shear box test, the plane of shear failure is predetermined
- (d) Better control is achieved on the drainage of the soil in a triaxial compression test

**Ans. (a) :** Unconfined compression test can be carried out on cohesive soils only

- It is a special case of triaxial test with  $\sigma_3=0$
- No confining cell pressure is used
- Load is rapidly applied, Hence it is an untrained test
- Stress distribution on the failure plane in the case of tri-axial compression test is uniform.
- In direct shear box test the plane of shear failure is predetermined
- Better control is achieved on the drainage of the soil in a tri-axial compression test



(a) The unconfined compression tester



(b) (c) Unconfined compression test

**130. The hydraulic head that would produce a quick condition in a sand stratum of thickness 1.5 m, specific gravity 2.67 and void ratio 0.67 is equal to**

- (a) 1.5 m
- (b) 1.0 m
- (c) 2.3 m
- (d) 1.75 m

**Ans. (a) :** Hydraulic head 'H' =  $t \left( \frac{G-1}{1+e} \right)$

$$H = 1.5 \left( \frac{2.67-1}{1+0.62} \right)$$

$$H = 1.5 \left( \frac{1.67}{1.67} \right)$$

$$H = 1.5 \text{ m}$$



**131. In a deposit of normally consolidated clay**

- (a) Effective stress and undrained strength increase with depth but water content decreases with depth
- (b) Effective stress, water content and undrained strength decrease with depth
- (c) Effective stress and water content increases with depth but undrained strength decrease with depth
- (d) Effective stress and undrained strength decrease with depth but water content increases with depth

**Ans. (a) :** In a deposit of normally consolidated clay Effective stress and undrained strength increase with depth but water content decreases with depth.

**132. Coefficient of consolidation for clays normally**

- (a) First increases and then decreases with increase in liquid limit
- (b) Increases with increase in liquid limit
- (c) Remains constant at all liquid limit
- (d) Decrease with increase in liquid limit

**Ans. (d) :** We know that –

$$C_c = 0.007 (w_L - 10)$$

$$C_c \propto w_L$$

Now,

$$\frac{\Delta H}{H} \propto C_c$$

$$\frac{\Delta H}{H} = \frac{\Delta e}{1 + e_0} \Rightarrow C_c \propto \Delta e$$

Now

$$a_v = \frac{\Delta e}{1 + e_0} \Rightarrow a_v \propto C_c$$

$$m_v = \frac{a_v}{1 + e_0} \Rightarrow m_v \propto C_c$$

Now, we know

$$K = C_v m_v \gamma_w$$

$$C_v \propto \frac{1}{m_v}$$

$$C_v \propto \frac{1}{C_c} \Rightarrow C_v \propto \frac{1}{w_L}$$

It means by increasing the liquid limit the coefficient of consolidation decreases.

**133. For a damped vibrating system with single degree of freedom resonance occurs at a frequency ratio of**

- (a) 0
- (b) 1
- (c) Less than 1
- (d) Greater than 1

**Ans. (b) :** For a damped vibrating system with single degree of freedom resonance occurs at a frequency ratio of 1.

**134. The ratio of bearing capacity of double under reamed pile to that of single under reamed pile is nearly**

- (a) 2
- (b) 1.5
- (c) 1.2
- (d) 1.7

**Ans. (b) :** In the under reamed pile, the ratio of double under reamed pile to the single UR pile is 1.5.

It means if the number of bulbs is increased from one to two, the carrying capacity increases by about 50%.

**135. If the proportion of soil passing 75 micron sieve is 50% and the liquid limit and plastic limit are 40% and 20% respectively, then the group index of the soil is**

- (a) 6.5
- (b) 65
- (c) 38
- (d) 3.8

**Ans. (a) :** Group index,  $GI = 0.2 a + 0.005 ac + 0.01 bd$   
 $a = \% \text{ passing } 75 \text{ mm sieve greater than } 35 \text{ but not exceeding } 75 \text{ (between } 0 \text{ to } 40).$

$b = \% \text{ passing } 75 \text{ mm sieve greater than } 15 \text{ but not exceeding } 55 \text{ (between } 0 \text{ to } 40).$

$c = \text{liquid limit greater than } 40 \text{ not exceeding } 60 \text{ (between } 0 \text{ to } 20)$

$d = I_p \text{ greater than } 10 \text{ and not exceeding } 30 \text{ (between } 0 \text{ to } 20)$

$$a = 50 - 35 = 15 < 40$$

$$b = 50 - 15 = 35 < 40$$

$$c = 40 - 40 = 0$$

$$d = 20 - 10 = 10 < 20$$

$$G.I. = 0.2 \times 15 + 0.005 \times 40 \times 0 + 0.01 \times 35 \times 10 = 3 + 0 + 3.5 = 6.5$$

**136. The minimum design speed for hairpin bends in hills roads is taken as**

- (a) 10 kmph
- (b) 20 kmph
- (c) 30 kmph
- (d) 40 kmph

**Ans : (b)**

(i) The minimum design speed for hair pin bends in hill roads is taken as 20 kmph.

(ii) Minimum radius of the inner curve = 14 m.

(iii) Minimum length of transition = 15 m

(iv) Super elevation in circulation portion of the curve = 1 in 10.

(v) Minimum width of carriageway

(a) At the apex of the curve are 11.5 and 9.0 m for two lane and single lane pavement of National highway & State highway.

**137. Expansion joints in cement concrete pavements are provided at an interval of**

- (a) 18 m to 21 m
- (b) 25 m to 30 m
- (c) 10 m to 15 m
- (d) 30 m to 40 m

**Ans. (b) :** Cement concrete pavements, expansion joints should be at an interval of 25m to 30m

As per IS 6509 : 1485 clause 5.3.1.2

Type of slab	Width of slab (m)	Spacing for expansion joint	Spacing for contraction joint
RCC	0.25	51 m	17 m
	0.20	45 m	14 m
	0.15	36 m	13 m
	0.15	30 m	7.5 m
PCC	0.20 & above	36 m	4.5 m
	0.15	27 m	4.5 m
	0.10	27 m	4.5 m

As per IRC the maximum specify speeding of contraction joints in rigid joints in rigid pavements is 4.5 m.

	0.20	45 m	14 m
	0.15	36 m	13 m
	0.15	30 m	7.5 m
PCC	0.20 & above	36 m	4.5 m
	0.15	27 m	4.5 m
	0.10	27 m	4.5 m

**138. For sandy soils the most common method of stabilization is**

- (a) Soil lime stabilization
- (b) Soil bitumen stabilization
- (c) Soil cement stabilization
- (d) Mechanical stabilization

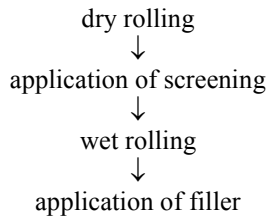
**Ans. (c) :** For Sandy soil stabilization method is most common method is soil cement stablization.

- Quantity of cement depend on quality and quantity of fines in sandy soils and final compacted density.
- It ranges between 5 to 12% of cement by weight.
- Quantity of cement in stabilization increases as soil plasticity increases.

**139. For the construction of water bound macadam roads, the correct sequence of operations after spreading coarse aggregate is**

- (a) Dry rolling, wet rolling application of screening and application of filter
- (b) Dry rolling, application of filter, wet rolling and application of screening
- (c) Dry rolling, application of screening, wet rolling and application of filter
- (d) Dry rolling, application of screening and application of filter and wet rolling

**Ans. (c) :** For construction of water bound macadam road we follow–



**140. Traffic flow is calculated by**

- (a) Multiplying measured
- (b) Multiplying measured traffic flow rate with road density
- (c) Multiplying road density with measured travel speed
- (d) Multiplying measured travel speed with road density

**Ans. (a) :** Traffic flow is the product of measured density and travel speed.

$$\text{Traffic flow} = \text{measured density} \times \text{travel speed}$$

**141. The maximum spacing of contraction joints in rigid joints in rigid pavements is**

- (a) 5.5 m
- (b) 4.5 m
- (c) 3.5 m
- (d) 2.5 m

**Ans. (b) :** As per IS 6509 : 1485 clause 5.3.1.2

Type of slab	Width of slab (m)	Spacing for expansion joint	Spacing for contraction joint
RCC	0.25	51 m	17 m

As per IRC the maximum specify speeding of contraction joints in rigid joints in rigid pavements is 4.5 m.

**142. Select the correct statement**

- (a) Minimum and maximum values of group index can be zero and 20 respectively
- (b) More the value of CBR, greater thickness of pavement will be required
- (c) More the value of group index, less thickness of pavement will be required
- (d) All of the above

**ODISHA PSC 24.08.2021**

**Ans. (a) : Design of pavement thickness–**

**Group index method–** This method is based on index properly of soil index properties are those which one used only for classification of soil such as liquid limit, plastic limits plasticity index. etc.

- The GI method of pavement design is essential an empirical method based on physical properties of the subgrade soil.

- This method does not consider the strength characteristics of the subgrade soil and therefore is open to question regarding the reliability of the design based on the index properties of the soil only.

Note :

GI value lies between 0 to 20.

Higher the GI value, poor the soil, hence higher thickness of pavement required.

Total thickness of pavement depends upon GI Value only whereas thickness of base and surface course depends upon GI value and traffic volume.

**143. Bitumen of grade 80/100 means**

- (a) Its penetration value is 8 cm to 10 cm
- (b) Its penetration value is 8 mm to 10 mm
- (c) Its penetration value is 8 cm
- (d) Its penetration value is 0 mm

**Ans. (b) :** Penetration test is the most commonly adopted to determine the grade of the bitumen in terms of its hardness because of its simplicity. Softer the bitumen, the greater will be the penetration values.

- 80/100 bitumen denotes that the penetration values of the binder ranges between 8 to 10 mm.

**144. The maximum design gradient for vertical profile of a road is**

- (a) Rulling gradient
- (b) Limiting gradient
- (c) Minimum gradient
- (d) Exceptional gradient

**Ans. (a): Ruling gradient:** It is the maximum gradient within which the designer attempts to design the vertical profile of a road. It is also known as design gradient.

**Limiting gradient**– The gradient steeper than the ruling gradient, which may be used for a limited road length, is called limiting gradient or maximum gradient.

**Minimum gradient**– The minimum desirable slope essential for effective drainage of rainwater from the purpose is 0.5% if the side drains are lined and 1% if the side drains are unlined.

**Exceptional gradient**- The gradient steeper than the limiting gradient which may be used in short length of road, only in an extraordinary situation is called exceptional gradient.

**145. The ruling design speed on a National highway in plain terrain as per IRC recommendations is**

- (a) 60 kmph (b) 45 kmph  
(c) 120 kmph (d) 100 kmph

**Ans. (d) :** Design speed for various classes of road in plain terrain is as follows -

- (i) NH & SH → 100 kmph  
(ii) MDR → 80 kmph  
(iii) ODR → 65 kmph  
(iv) VR → 50 kmph  
(v) Expressways → 120 kmph

**146. In triangulation, the best shape of the triangle would be**

- (a) Equilateral  
(b) Right angled isosceles  
(c) Isosceles with two base angles of  $65^{\circ}14'$   
(d) Isosceles with two base angles of  $56^{\circ}14'$

**Ans. (d) :** The shape of the triangle in which any error in angular measurements has a minimum effect upto the lengths of the computed sides is known as well conditioned triangle. Hence the best shape of a triangle is an isosceles triangle whose base angles are  $56^{\circ}14'$ .

**147. The length of transition curve for a circular curve of radius 300 m and for a design speed of 15 m/s, when the rate of change of centrifugal acceleration is  $0.3 \text{ m/s}^2$ , is**

- (a) 60.53 m (b) 45.25 m  
(c) 30.75 m (d) 37.5 m

**Ans. (d) :** Radius of curve (R) = 300 m

Design speed (V) = 15 m/s

Rate of change acceleration (c) =  $0.3 \text{ m/s}^2$

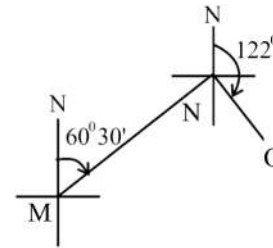
$$\text{Length of transition curve } (L_s) = \frac{V^3}{CR}$$

$$= \frac{15^3}{0.3 \times 300} = 37.5 \text{ m}$$

**148. If the bearing of a line MN is  $60^{\circ}30'$  and that of NO is  $122^{\circ}$  of a closed traverse MNO PQ, then the measures of interior angle N is**

- (a)  $154^{\circ}$  (b)  $118^{\circ}30'$   
(c)  $122^{\circ}00'$  (d)  $240^{\circ}30'$

**Ans. (b) :**



$$\text{Interior angle N} = 60^{\circ}30' + 180^{\circ} - 122^{\circ}$$

$$= 118^{\circ}30'$$

**149. A 3000 m long line lying at an elevation of 450 m measures 10 cm on a vertical photograph. The focal length of the camera is 21 cm. The scale of the photograph for the area having an elevation of 1000 m will be**

- (a) 1 : 25008  
(b) 1 : 27381  
(c) 1 : 37231  
(d) 1 : 22222

**Ans. (b) :** Scale  $S = \frac{f}{H-n}$

For 1st case –

$$\text{Scale} = \frac{10}{3000 \times 100} = \frac{1}{30000}$$

$$\text{Now } \frac{1}{30000} = \frac{0.21}{H-450}$$

$$\text{Flying height, } H = 6740 \text{ m}$$

For 2nd case–

$$\text{Scale} = \frac{f}{H-n}$$

$$S = \frac{0.25}{6740-1000} = 1 \text{ in } 27381$$

**150. Which of the following is not a part of a total station**

- (a) Electronic transit theodolite  
(b) Electronic distance bar  
(c) Microprocessor  
(d) Subtensebar

**Ans. (d) : Total station**– The total station is a combination of an electronic theodolite and an electronic distance meter (EDM)

**Parts of total stations–**

- Electronic transit theodolite
- Electronic distance bar
- Microprocessor
- Data input/output connector
- Instrument height mark
- Display
- Operation panel.



# Odisha Public Service Commission

Assistant Soil Conservation Officer (ASCO)

## Exam- 2021 (Paper-I)

1. What is the contribution of agriculture in the national GDP of India?

- (a) 10% (b) 15%  
(c) 30% (d) 50%

**Ans. (\*) :** According to economic survey 2021-22 the contribution of agriculture in the national GDP of India is about to 20.2% in 2020-21 and 18.8% in 2021-2022.

2. The Major emission of CO<sub>2</sub> to the atmosphere is from :

- (a) Biosphere (b) Hydrosphere  
(c) Lithosphere (d) Stratosphere

**Ans. (a) :** The major emission of CO<sub>2</sub> to the atmosphere is from biosphere at which lithosphere, hydrosphere and atmosphere meets.

3. The total Geographical area of India is:

- (a) 144 mha (b) 197 mha  
(c) 276 mha (d) 329 mha

**Ans. (d) :** The total geographical area of India is 3.28 million sq. kilometer

$$\therefore 1 \text{ hac} = 10^4 \text{ m}^2$$

$$\therefore 1 \text{ km}^2 = 100 \text{ hac}$$

$$= 3.28 \times 100 \times 10^6 \text{ hac} \\ = 328 \text{ mha}$$

4. The country having largest irrigation area in the world :

- (a) China (b) India  
(c) Egypt (d) USA

**Ans. (a) :** China having the largest irrigation area country in the world.

1. China ( $\approx$  70 Mha)
2. India ( $\approx$  67 Mha)
3. USA ( $\approx$  22 Mha)

5. Total horticulture crop production of India in 2020-21 :

- (a) 98 mt (b) 185 mt  
(c) 292 mt (d) 313 mt

**Ans. (d) :** The horticulture crops (i.e. fruits, vegetable, medical aromatic plants etc.) production of India in 2020-21 is about to 310 million tonne and 296 million tonne in 2019-2020.

6. Which among the following input can be used in organic farming ?

- (a) Masanobu Fukuoka (b) Albert Howard  
(c) Lady Eva Balfour (d) Charles Walton

**Ans. (c) :**

**Masanobu Fukuoka**–Japanese former- Natural farming  
**Albert Howard**–Founder of organic farming movement  
**Lady Eva Balfour**–Farmer–Organic farming 1<sup>st</sup> time  
**Charles Walton**–Patent holder for RFID device.

7. The Kisan Credit Card (KCC) Scheme was launched in the year :

- (a) 1971 (b) 1956  
(c) 1998 (d) 1988

**Ans. (c) :** The Kisan Credit Card scheme was launched in 1998 for helping farmers avail short term loan and a credit limit to purchase equipments for agriculture.

These are of two types–

- (i) Cash credit  
(ii) Term credit

KCC is launched on the recommendation of R.V. Gupta committee.

8. Which among the following gas destroys the chlorophyll content in plants ?

- (a) CO<sub>2</sub> (b) CO  
(c) SO<sub>2</sub> (d) O<sub>3</sub>

**Ans. (c) :** Sulphur dioxide (SO<sub>2</sub>) is a major air pollutant and plants are mainly sensitive to SO<sub>2</sub> because the process of photosynthesis is mainly affected by the increased concentration of sulphur dioxide and leaves become yellow.

9. What is green GDP?

- (a) Net value of GDP after discounting the cost incurred due to man-made destruction  
(b) Net value of GDP after discounting the money earned by NRI  
(c) Net value of GDP after discounting the cost-incurred due to natural calamities  
(d) Net value of GDP after discounting the cost incurred due to environmental degradation

**Ans. (d) :** Green GDP–Net value of gross domestic product after discounting the cost incurred due to environmental degradation.

$$\text{Green GDP} = \text{GDP} - \text{Environment degradation cost}$$

10. Flow of energy in the ecosystem is :

- (a) Unidirectional  
(b) Bidirectional  
(c) Circular  
(d) Both uni-and bidirectional

**Ans. (a):** The flow of energy in an ecosystem is always unidirectional because some energy is lost in form of heat when moving from one trophic level to the next for the maintenance of the homeostasis of an organism.

**11. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) launched in the year :**

- (a) Launched in 1st July, 2015
- (b) Launched in 2nd February, 2006
- (c) Launched in 21st January 2004
- (d) Launched in 2nd October, 1953

**Ans. (a) :** Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) launched on 1st July 2015 with the motto of "Har Khet Ko Pani". It is being implemented to expand cultivated area with assured irrigation reduce wastage of water and improve water use efficiency.

**12. Who is known as father Of Indian Ecology ?**

- (a) R. Mishra
- (b) B. Sahani
- (c) R. Carson
- (d) Eamst Haeckel

**Ans. (a) :** Prof. Ramdeo Mishra is known as father of Indian Ecology. He laid the foundation of ecology and environmental science in the country.

**Birbal Sahani**–Paleobotanist

**Rachel Carson**–American marine biologist

**Earnest Haeckel**–German zoologist

**13. What is the Percentage share of export earning from Agricultural Export ?**

- (a) 10%
- (b) 25%
- (c) 40%
- (d) 55%

**Ans. (b) :** The share of Agriculture Export in total earning from export in 2020-21 is about to 25%.

**14. Which is not true for ecosystem?**

- (a) Energy flow
- (b) Nutrient cycling
- (c) Interacting components
- (d) Static

**Ans. (d) :** The ecosystem consists of energy flow, nutrient cycling interacting components etc. It is a dynamic in nature so that static is not a nature of ecosystem.

**15. Highest nutry-cereal producing country in the world is :**

- (a) USA
- (b) China
- (c) Ethiopia
- (d) India

**Ans. (b) :** Highest nutry-cereal producing country in the world.

- (i) China
- (ii) USA
- (iii) India

**16. The protective layer of Ozone is located in which of the following atmospheric layer?**

- (a) Troposphere
- (b) Stratosphere
- (c) Mesosphere
- (d) Thermosphere

**Ans. (b) :** The ozone layer exists in the lower regions of the stratosphere. The ozone has a protective role in the upper atmosphere to prevent the UV rays from the reaching the earth surface.

**17. Which state is having the highest cropping intensity in India?**

- (a) Punjab
- (b) Haryana
- (c) UP
- (d) WB

**Ans. (a) :** Punjab have the highest cropping intensity in India.

To complete the agricultural demand of the country can be done by expanding the cultivation area or intensifying cropping over existing area.

$$\text{Cropping Intensity} = \frac{\text{Gross cropped area}}{\text{Net sown area}} \times 100$$

Thus, the cropping intensity means the portion of the net area which is being cropped.

**18. Which gas is likely to increase by afforestation?**

- (a) N<sub>2</sub>
- (b) O<sub>2</sub>
- (c) CO<sub>2</sub>
- (d) N<sub>2</sub>O

**Ans. (b) :** Afforestation is the process of creating new forests which play an important role in maintaining proper balanced environment. Afforestation increases the % of oxygen and reduces the % of carbon dioxides.

**Note**–Deforestation increases the % of CO<sub>2</sub>.

**19. Seed rate of Papaya for one hectare is:**

- (a) 150 – 200 gm
- (b) 250 – 450 gm
- (c) 450 – 700 gm
- (d) 1000 – 1200 gm

**Ans. (b) :** Papaya is a tropical fruit grows well in the mild sub-tropical regions of the country. Sandy loam soil is ideal for cultivation of papaya. It requires 250-450 gm seed for every hectare of cultivation area for proper growth.

$$\text{Seed rate} = (250-450 \text{ g})/\text{ha}$$

**20. What is the contribution of agriculture in employment generation of India?**

- (a) 15%
- (b) 35%
- (c) 45%
- (d) 65%

**Ans. (c) :** According to the Economics times of India the contribution of agriculture in employment generation in India is about to 45% in 2019-20 and approximately 35% in 2017-18.

**21. Which one among the following is the biotic component of an ecosystem?**

- (a) Producer
- (b) Consumer
- (c) decomposer
- (d) All of these

**Ans. (d) :** Biotic components are made up of organisms, which are living and dead both.

**Components**–

- (i) Autotrophs/producers
- (ii) Heterotrops/consumers
- (iii) Decomposers

22. What would happen to the temperature of the Earth if there were no atmosphere surrounded?
- No effect
  - Go on increasing
  - Go on decreasing
  - Increasing in day and decreasing in night time

**Ans. (d) :** If there were no atmosphere around the earth, then the temperature of the earth will increase during day and decreasing during night (like moon) because air is a ban conductor of heat and it help in temperature control of surrounding.

23. Which among the following is a Non-renewable Natural Resource ?
- Soil
  - Water
  - Coal
  - Wildlife

**Ans. (c) : (A) Non-renewable Natural Resource.**

- Coal
- Petroleums
- Bio gases/fuel gases etc.

**(B) Renewable Resources**

- Solar Energy
- Wind
- Water etc.

24. Total food grain production of India in 2020-21:
- 230 mt
  - 281 mt
  - 292 mt
  - 313 mt

**Ans. (d) :** The total food grain production in India in 2020-21 is about to (30 g) million metric tonnes and it is assumed that the growth in further years it will (2-3%) or more than previous.

25. Which among the following are the components of Liquefied Petroleum Gas?
- Methane and Ethane
  - Methane and propane
  - Propane and Ethane
  - Propane and Butane

**Ans. (d) :** The main components of liquefied petroleum gas are propane, butane, propylene, butylene and isobutane. It is a highly flammable in nature which is used as a fuel in household cooking applications.

26. "More crop per drop" is the Slogan for which among the following scheme ?
- Soil Health card
  - PMKSY
  - PKW
  - PMFBY

**Ans. (b) :** "Per drop more crop" It is a centrally sponsored micro irrigation scheme administered by the department of agriculture, cooperation and farmers welfare on 1<sup>st</sup> July 2015 under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

**Soil health card**– 19<sup>th</sup> Feb 2015

**Pradhan Mantri Fasal Bima Yojana**– 18<sup>th</sup> Feb 2016

27. The Chipko Movement started by Sunderlan Bahuguna in 1973 to conserve :
- Soil
  - Water
  - Forest
  - Endangered animals

**Ans. (c) :** The Chipko movement started by Sunderlan Bahuguna in 1973 to conserve the forest. It is a nonviolent social and ecological movement by rural villagers particularly women in India.

28. Agriculture price support policy of the Government mainly aims to benefit:
- Farmers and consumers
  - Middleman
  - Industrialist
  - Government

**Ans. (a) :** Agriculture price support policy of the government mainly aims to benefit farmers and consumers.

**Objectives:**

- Protecting farmers interests
- Maintaining a reasonable price for agricultural products
- Increasing agricultural production

29. The amount of energy that transfer from producer to primary consumer in food chain is:
- 10%
  - 30%
  - 50%
  - 90%

**Ans. (c) :** The amount of energy that transfer from producer to primary consumer in food chain is about to 50%. The energy flow in ecosystem is one of the major factors that support the survival of many organisms.

30. The new Agriculture Policy was established in :
- 2010
  - 2005
  - 2000
  - 2008

**Ans. (c) :** The GOI announced a new agriculture policy on July 28, 2000 to promote economically viable, environmentally non-degrading and acceptable use of natural resources for sustainable development of agriculture.

31. Ten Ecosystem was coined by :
- AG Tansley
  - EP Odom
  - Charles Elton
  - Lindeman

**Ans. (a) : Ecosystem**–The community or group of living organisms that live in and interact with each in a specific environment. The term ecosystem was coined by A.G. tansley in 1935.

32. Amritsagar is important cultivar of :
- Beal
  - Mango
  - Banana
  - Guava

**Ans. (c) : Amritsagar Banana**–They are known for their medium size and bright yellow colour. It is a good source of potassium, vitamin C; and fiber and also contain small amount of protein, magnesium and vitamin B<sub>6</sub>. It is widely available in Bangladesh.

33. Out of total 35 global biodiversity hotspots, how many are located in India ?

- (a) 4 (b) 6  
(c) 7 (d) 10

**Ans. (a) : Biodiversity**—It refer as the variation of plant and animal species in a particular habitat. There are 4 major biodiversity hotspots in India.

1. The western ghats
2. The Himalayas
3. Sundaland
4. Indo-Burma Region

34. Which among the following sector is the Major Non Point source of pollution ?

- (a) Agriculture (b) Industry  
(c) Manufacture (d) Infrastructure

**Ans. (a) : Types of water pollution on the basis of source.**

**(i) Point source**—The source of pollution which are close to the water source are called as point source of pollution. This is more harmful then non point source. Ex. Sewage, power plant wastes, Oil wells, coal mines etc.

**(ii) Non-point source**—The source of pollution are scattered and not specified their location. This is less harmful. Ex. runoffs from gardens, roads, constructions, agricultural herbicides etc.

35. Which among the following Radiation is responsible for Ozone layer formation ?

- (a) Cosmic rays (b) U.V. rays  
(c) Visible rays (d) Infra rays

**Ans. (b) : Ultra violet rays** are responsible for ozone layer formation. Ultra violet rays splits O<sub>2</sub> molecules into oxygen atoms these single atoms then react with other O<sub>2</sub> molecules to produced O<sub>3</sub> (ozone).

36. What is the cropping intensity of India ?

- (a) 111% (b) 126%  
(c) 136% (d) 146%

**Ans. (c) : Cropping Intensity**—It is the way to increase crop production from the same area of land and it defined as the no. of crops grows on the field in given agricultural year.

$$C.I. = \frac{\text{Gross total cropped area}}{\text{Net sown area}} \times 100$$

The current cropping intensity in India is about to 136%.

37. Which among the following is not a conservation tillage option ?

- (a) Zero tillage (b) Minimum tillage  
(c) Clean tillage (d) Both (A) and (B)

**Ans. (c) : Conservation tillage**—Any method of soil cultivation that leaves the previous year's crop residue on the field before and after planting the next crop in order to decrease soil erosion. These are of following options/tillage.

- (i) Zero/No/Minimum tillage  
(ii) Mulch tillage  
(iii) Strip or zonal tillage  
(iv) Ridge tillage etc.

38. Which among the following is an in-situ Agricultural Waste Management Process ?

- (a) Green Manuring  
(b) Mukhing  
(c) Green Leaf Manuring  
(d) All of these

**Ans. (d) : In-situ Agricultural waste management** is the process of decomposition of wastage at their origin or existence.

These are of following types of process—

- (i) Mulching  
(ii) Green Manuring  
(iii) Green Leaf manuring

39. In India Cyclonic storms generally observed during :

- (a) April-May (b) June-July  
(c) October-November (d) Both (a) and (c)

**Ans. (c) : Cyclones**—These are caused by atmospheric disturbance around a low-pressure area distinguished by swift and often destructive air circulation.

These are two types—

- (i) Cyclones  
(ii) Anti-Cyclones

In India cyclonic storms are generally observed in May-June or October-November.

40. How many soil parameters been taken to develop soil health card ?

- (a) 4 (b) 8  
(c) 12 (d) 16

**Ans. (c) : Soil Health Card**—It is a report of soil which contain the status of soil with respect to 12 parameter i.e. Nitrogen, phosphorous, potassium (known as micro-nutrients), sulphure, zinc, iron, copper, manganese, boron and physical parameters i.e. pH, Ec, OC.

Soil health card will also indicate fertilizer recommendations and soil amendment if required.

41. The best soil structure for favourable Physical Properties is :

- (a) Crumby and Granular  
(b) Platy and Laminar  
(c) Columnar and prismatic  
(d) Blocky

**Ans. (a) : Types of soil structure**—

- (i) Platy (ii) Prismatic  
(iii) Columnar (iv) Blocky  
(v) Crumby and granular

**Crumby and granular**—These are the most favorable structure of soil for the growth of plant. It is a combination of sand, silt and clay in small and spherical grains due to which circulation of water easily takes place.

42. Which one of the following is the aim of Integrated Pest Management ?

- (a) Increasing natural enemies of the pest
- (b) Strengthening the host
- (c) Keeping pest populations below injurious levels
- (d) Billing the pest

**Ans. (c) : Integrated Pest Management**—The main aim of integrated pest management is not to eliminate all types of pests. There are many types of pests available which are essential for the crops. Rather the aim is to keep pest population below injurious levels.

43. The degree to which a soil resists deformation when a force applied is termed as :

- (a) Field capacity
- (b) Capillary capacity
- (c) Consistency
- (d) Friability

**Ans. (c) :** Consistency is the degree to which the soil resists its deformation under an action of applied force. Degree of consistency is defined as the range of consistency index of soil.

**Field capacity** = Max. water holding capacity

**Capillary capacity** = Max. height of capillary rise

**Friability** = Softness of soil.

44. Which of the following is not the selective herbicides ?

- (a) 2, 4D
- (b) Simazine
- (c) Paraquat
- (d) Butachlor

**Ans. (c) : Selective herbicides**—The herbicide which is applied to the crop will control and suppresses the targeted weed species without affecting the growth of existing crop in the field is termed as selective herbicides.

**Example—**

- (i) Simazine
- (ii) Butachlor
- (iii) 2, 4 Di amine etc.

45. At which pH better growth of plants is found ?

- (a) 4-5
- (b) 5-6
- (c) 6.5-7.5
- (d) 8-9

**Ans. (c) :** Better pH range of soil for the optimum growth of plants is 5.5-6.5, if pH decreases below 5.5 then soil become very acidic which is not suitable for many crops. So according to the option 6.5-7.5 will be more closed to optimum condition.

46. Which of the following is an example of Mimicry Weed ?

- (a) Green gram RMG-344 in green gram RMG-492 crop
- (b) Black gram in green gram crop
- (c) Chenopodium murale in berseem crop
- (d) Phalaris minor in wheat crop

**Ans.(d):Phalaris minor**—It is a noxious weed associated with the wheat crop which causes severe yield losses if these are not controlled by herbicides. Phenotypic mimicry with wheat crop and resistance development has created a major hurdle in controlling them.

47. National Bureau of Soil Survey and Land Use Planning (NBSS and LUP) was established in the year :

- (a) 1934
- (b) 1955
- (c) 1976
- (d) 1985

**Ans. (c) :** The research aspects of soil survey, classification and further in 1976 an independent institute of ICAR named as National Bureau of soil survey and land use planning (NBSS & LUP) was established.

48. Rill erosion usually begins in the :

- (a) Lower part of land slope
- (b) Upper part of land slope
- (c) Middle of land slope
- (d) Entire length of land slope

**Ans. (b) : Rill erosion**—It is often called as micro channel irrigation. It is the removal of soil by running water through cutoff and water course.

When, water from precipitation does not infiltrate into the soil and run off over the surface of the soil at the same place continuously then rill erosion takes place.

49. Consider the following statements :

**Assertion (A) : Phosphorus, availability is poor in acid soils.**

**Reason (R) : Phosphorus, is leached from acidic soils codes.**

- (a) (A) is true but (R) is wrong
- (b) (R) is true but (A) is wrong
- (c) Both (A) and (R) are true
- (d) Both (A) and (R) are false

**Ans. (c) :** The phosphorus content of soil is influenced by the pH of soil. When soil is very acidic, phosphorus reacts with iron (Fe) and aluminium (Al) which results in lack of phosphorus for the plants. But when soil is too alkaline then phosphorus react with calcium (Ca) and also become unavailable for plants.

Water is the primary driver of phosphorus loss in the form of dissolved phosphorus.

50. Nutrient deficiency caused chlorosis in older leaves of plants :

- (a) Sodium
- (b) Calcium
- (c) Magnesium
- (d) Nitrogen

**Ans. (c) :** Chlorosis is the less of the green coloration of leaves of plants due to deficiency of nutrient which results in yellowing of leaves chlorosis caused by the deficiency of iron, nitrogen, potassium, magnesium etc. Magnesium is the main constituent of chlorophyll due to which leaves become green.



51. **Vertical section of soil is called as :**  
 (a) Soil profile (b) Soil Horizon  
 (c) Soil column (d) Regolith

**Ans. (a) : Soil Profile**—The vertical section of soil mass is termed as soil profile which allow to examine the structure of the soil particles.

A soil profile is divided into 4 layers-

- (i) A-horizon  
 (ii) B-horizon  
 Most important for plant growth (Top 2 layers)  
 (iii) C-horizon—Consists of weathering rock  
 (iv) D-horizon—Consists of bed rock.

52. **The essential constituent of chlorophyll is :**  
 (a) Calcium (b) Sulphur  
 (c) Nitrogen (d) Iron

**Ans. (c) :** The essential constituent of the chlorophyll is magnesium which is located at the centre of pigment in chlorophyll. Nitrogen is a mineral element required by plants in large amount. It is also a constituent of the pigment of chlorophyll.

53. **Plays a Major role in energy storage and transfer of ADP into ATP molecules :**  
 (a) Mg (b) Fe  
 (c) P (d) Mo

**Ans. (c) :** Phosphorus is a major constituent of energy rich nucleotids like (ATP, ADP etc). Therefore it is indispensable for reactions involving in energy transfer in living organisms.

54. **Kresek Phase Symptom found in plant disease :**  
 (a) Black arm of cotton  
 (b) Bacterial leaf blight of rice  
 (c) Leaf curl of chilli  
 (d) Late blight of potato

**Ans. (b) : Kresek Phase Symptom**—Wilting and yellowing of leaves or wilting of seedlings is called as Kresek phase symptom. It is found in rice. The bacterial leaf blight of rice is the symptoms of kresek phase in rice. Infected leaves turn grayish green and roll up and further leaves turn yellow to straw coloured and wilting takes place.

55. **The following soil water is held due to adsorption forces :**  
 (a) Gravitation water  
 (b) Capillary water  
 (c) Hygroscopic water  
 (d) Hygroscopic and Capillary water

**Ans. (c) : Hygroscopic water**—Hygroscopic water is defined as the water that is held by the soil particles at the suction of more than 31 bars due to force of adsorption.

Hygroscopic water is held so tenaciously that plants are not able to absorb it and therefore it is unavailable to plants.

56. **The deficiency symptoms of calcium and Boron are generally observed on:**  
 (a) Young leaves in terminal bud  
 (b) Older leaves  
 (c) Lower leaves  
 (d) Older and new leaves

**Ans. (a) :** The deficiency symptoms of calcium and Boron are generally observed on young leaves in terminal bud. The growth is inhibited and plants have a pushy appearance.

57. **The decomposition of organic matter in soil reduces:**  
 (a) Acidity (b) Alkalinity  
 (c) Fertility (d) Salinity

**Ans. (b) :** Decaying organic matter produces  $H^+$  which is responsible for acidity so that acidity will increases and it reacts with the alkane presents into the soil therefore alkalinity of soil reduces and salinity also increases.

58. **The propagating, material of Napier grass, Guinea grass, Para grass etc called :**  
 (a) Setts (b) Rotted slips  
 (c) Corms (d) Tubers

**Ans. (a) :** The stem cutting or section of the stalks which is used for propagating Napier grass, Guinea grass is called as 'setts'.

59. **The disease resistance in plants is imported by :**  
 (a) Potassium (b) Molybdenum  
 (c) Nitrogen (d) Manganese

**Ans. (c) :** The disease resistance in plants is imported by Nitrogen and iron mainly because are the one of the most important micronutrients having a significant impact on the pathogens.

60. **Which is an illustration of relay cropping ?**  
 (a) Paddy-Wheat  
 (b) Soyabean-Maize  
 (c) Maize-Toria-Wheat  
 (d) Maize - Potato - Wheat -Moong

**Ans. (b) : Relay cropping**—The cropping system in which succeeding crop is sowing before the harvesting of preceding crop.  
 Soyabean-Maize

61. **Diocous variety of papaya is :**  
 (a) Pusa Majesty (b) Pusa Nanha  
 (c) Pusa Delicious (d) Sunrise solo

**Ans. (b) :**

Papaya variety	-	Characteristics
Pusa Dwarf/Nanha	-	Dioecious
Pusa Giant	-	Dioecious
Pusa Majesty	-	Gynodioecious
Pusa delicious	-	Gynodioecious

62. The natural aggregates of soil are known as :

- (a) Peds (b) Clods  
(c) Fragments (d) Grid

**Ans. (a) :** The natural aggregates of soil are known as soil structure or peds.

Types of soil peds–

- (i) Granular and crumb structure  
(ii) Blocky and subangular blocky  
(iii) Prismatic and columnar  
(iv) Platy structure

63. Edible part of coconut is :

- (a) Mesocarp (b) Endocarp  
(c) Endosperm (d) Perianth

**Ans. (c) :** The edible part of coconut is endosperm (coconut meat and water). The hard cover over the endosperm is termed as endocarp and fiber husk of coconut is called as mesocarp.

64. Which one of the following parent material is transported by gravity?

- (a) Glacial (b) Colluvial  
(c) Eolicum (d) Alluvial

**Ans. (b) :**

Material	-	Transporting agency
Colluvial	-	Gravity
Glacial	-	Glacier
Alluvial	-	Running water
Aeoline	-	Wind

65. ETLro. Of aphids for successful seed Plot Technique (SPT) in Potato is :

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

**Ans. (b) :** Seed plot technique (SPT) is described as raising the crop during a period when aphid population is very low after taking precaution such as use of insecticides against aphids.

Economical threshold level of aphids for successful seed plot technique in potato is 20.

66. Passive factors of soil formation includes :

- (a) Parent Material (b) Climate  
(c) Organisms (d) None of these

**Ans. (a) :** Topography, time duration and parent material are noted as passive factors because their effects are not observed immediately.

**Active factors**–Rainfall, heat temperature, wind climate, microorganism etc.

67. Chemical uses for control for Pre-harvest drop of citrus is :

- (a) 2-4D@20ppm (b) 2-4D@200ppm  
(c) NAA@50ppm (d) NAA@500ppm

**Ans. (a) :** 20ppm@2-4D chemical is used for control of pre harvest drop of citrus.

68. Arrangements of Primary and Secondary soil particles in a certain pattern called :

- (a) Soil concentration (b) Soil structure  
(c) Soil texture (d) Soil stabilization

**Ans. (b) : Soil structure**–An arrangement of primary and secondary soil particles in a certain pattern is called as soil structure.

Soil structure according to shape of individual aggregate

- (i) Granular and crumb  
(ii) Blocky  
(iii) Prismatic and columnar  
(iv) Platy

69. Mridula is a variety of :

- (a) Guava (b) Ber  
(c) Pomegranate (d) Aonla

**Ans. (a) : Mridula**–

- It is a variety of guava.
- Plants are semi-tall and spreading.
- Fruits are round in shape.
- It is an open pollinated seedling of Allahabad safeda
- White flesh and yellow skin.

70. Flame Photometer is used in the determination of :

- (a) Nitrogen (b) Phosphorous  
(c) Potassium (d) Boron

**Ans. (c) : Flame photometer**–It is an instrument which is used to determine the concentration of certain metal ions like sodium potassium, lithium and calcium in terms of emission.

The intensity of the emission is directly proportional to the number of atoms return to the ground state.

**Element Flame colour**

Sodium	Yellow
Potassium	Violet
Barium	Green
Lithium	Red
Calcium	Orange

71. Bio 212 is a somaclonal variety of :

- (a) Brassica juncea  
(b) Lathyrus sativus  
(c) Lycopersicon esculentum  
(d) Citronella java

**Ans. (b) : Somaclonal variation**–It is defined as genetic variation observed among progeny plants obtained after somatic tissue culture in vitro.

Bio 212 is a somaclonal variety of lathyrus (Lathyrus sativas).

72. Which of the following clay mineral is dominant in red soil ?

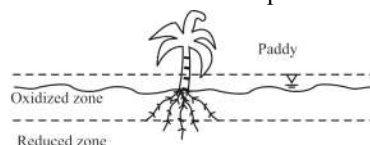
- (a) Smectite (b) Mica  
(c) Kaolinite (d) Illite

**Ans. (c):** Kaolinite is a dominant clay mineral of red soil with small quantity of illite mineral. Kaolinite is a two layer unit that is formed by stacking a gibbsite sheet on a silica sheet bonded with strong hydrogen bond.

**73. Consider the following statements :  
In Paddy crop, fertilizer application should be directed to the :**

- (I) Oxidised zone
- (II) Reduced zone
- (III) Surface
- (a) Only (I) is correct
- (b) Only (II) is correct
- (c) (II) and (III) is correct
- (d) (I) and (III) is correct

**Ans. (a) :** In paddy crop, fertilizer application should be directed in the oxidised zone of crop.



**74. Which one of the soil component has highest CEC ?**

- (a) Kaolinite
- (b) Montmorillonite
- (c) Vermiculite
- (d) Organic Matter

**Ans. (c) :** The sum of exchangeable cations that a soil can absorb is called as cation exchange capacity. Vermiculite has highest cation exchange capacity of 100-150 milli equivalent/100 g.

Soil component	CEC
Kaolinite	3-15 Meg/100g
Montmorillonite	80-100 Meg/100g
Halloysite	40-50 Meg/100g
Illite	10-40 Meg/100g
Smectite	80-120 Meg/100g

**75. Grassy shoot disease of sugarcane is caused by:**

- (a) Fungi
- (b) Bacteria
- (c) Virus
- (d) Mycoplasma

**Ans. (b) : Grassy shoot disease**—It is characterised by proliferation of vegetative buds from the base of the cane giving rise to crowded bunch of tillers bearing narrow leaves. It is caused by a bacteria named as phytoplasma.

**76. The rate of decomposition of lignins and phenolic compound is :**

- (a) Rapid
- (b) Very slow
- (c) Slow
- (d) Medium

**Ans. (b) :** The rate of decomposition of lignins and phenolic compound is very slow when it is heated up by 10°C/min. It losing only 40% of its initial mass below 700°C.

**77. Golden rice can mitigate the deficiency of:**

- (a) Vitamin D
- (b) Vitamin C
- (c) Calcium
- (d) Vitamin A

**Ans. (d): Golden rice**—It is a genetically modified (GM) crop which can mitigate the deficiency of vitamin 'A'. The deficiency of vitamin 'A' causes serious health problem like blindness and premature death.

**78. The suitable Nitrogen fertilizer for sodic (Alkali) soil is :**

- (a) Sodium Nitrate
- (b) Ammonium sulphate
- (c) Urea
- (d) Ammonium chloride

**Ans. (b) :** The suitable nitrogen fertilizer for sodic (alkali) soil is ammonium sulphate or Ammonium nitrate. The pH of sodic soil is more than 8.5.

**79. In grafting lower part of plant is known as :**

- (a) Stock
- (b) Apical
- (c) Bud
- (d) Scion

**Ans. (a) :** Grafting is a technique whereby tissues of plants are jointed so that they continue their growth together.

The upper part of the combined plant (graft) is called as scion while the lower part is called as rootstock.

**80. Which of the following instrument is used for measuring soil strength ?**

- (a) Dynamometer
- (b) Penetrometer
- (c) Hydrometer
- (d) Thermometer

**Ans. (b) : Penetrometer**—Penetrometer, drop-cone penetrometer and pocket penetrometer are used to measure the strength of soil at different depth up to 150 mm in cultivated or uncultivated seed beds in a loam and sandy clay loam.

Instrument	Used
Dynamometer	– Mechanical force
Thermometer	– Temperature
Hydrometer	– Density

**81. Hermaphrodite variety of papaya is :**

- (a) Sunrise solo
- (b) Coorge Honey Dew
- (c) Surya
- (d) CO-3

**Ans. (b) : Coorge Honey Dew**—It is a gynodioecious, semi dwarf hermaphrodite variety of papaya. The fruits are big weighing 1.75 to 2 kg dark green in colour with slight ridging skin surface.

**Other varieties of papaya—**

- (1) Mexican Red Papaya
- (2) Hawaiian Sunrise Papaya
- (3) Hawaiian Sunset Papaya
- (4) Bettina Papaya
- (5) Guinea Gold Papaya
- (6) Hortus Gold etc.

**82. Baby com is harvested at the stage of:**

- (a) 2-3 days after silking
- (b) 2-3 days after tasseling
- (c) Milk stage
- (d) R4 stage

**Ans. (a):** The baby corn is harvested at the stage of 2-3 days after silking. It is ready for harvest after 50-60 days after sowing.

**83. use of crop rotation fame reduction of pest population pest attack is a method :**

- (a) Cultural (b) Physical  
(c) Chemical (d) Mechanical

**Ans. (b) :** Crop rotation replaces a crop that is susceptible to a serious pest with another crop that is not susceptible is a physical method of reduction of pest population of crops.

- Cultural methods—by tillage works
- Chemical methods—by pesticides

**84. Which one of the following is a double cross hybrid variety of Mango?**

- (a) Sindhu  
(b) Alphanso  
(c) Neelam  
(d) Arka suprabhat (H-14)

**Ans. (d) : Arka suprabhat (H-14)**—It is a double cross hybrid variety of mango between Amrapal (Deshehari × Neelum) × Arka anmal (Alphanso × Janardhan).

**Note**—Sindhu is almost seedless variety of mango.

**85. Application of Muriate of potash is generally not recommended for :**

- (a) Wheat, Batty, Mustard  
(b) Bajara, Sorghum, Maize  
(c) Sugarcane, Sugarbeet, Tobacco  
(d) Groundnut, Sesamum

**Ans. (c) : Muriate of potash**—It is also known as potassium chloride contains 60% potash which is essential for plant growth and quality by producing proteins and sugars.

It is not recommended for sugarcane tobacco and sugarbeet crops.

**86. Consider the following statements :**

- (I) Maize is C4 plant  
(II) Kranz anatomy present tin C4 plant  
(III) Photo-respiration does not occur in C3 plant  
(a) (I) only (b) (I) and (III) only  
(c) (II) and (III) only (d) (I) and (II) only

**Ans. (d) : Coplants**—In C4 plants photo-respiration does not occur because they have a mechanism that increases the concentration of CO<sub>2</sub> at enzyme site. Kranz anatomy is a specialized structure in C<sub>4</sub> plants where mesophyll cells are clustered around the cells in ring like structure. Ex. : Maize, sugarcane, sorphum etc.

**87. Concentric ring or target board Symptoms found in disease is caused by :**

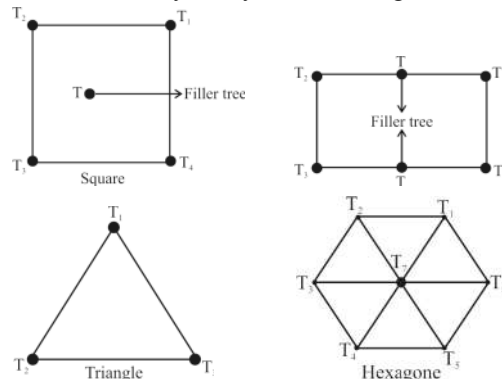
- (a) Phythium (b) Cercospora  
(c) Alternaria (d) Phytophthora

**Ans. (c):** Concentric ring or target board symptoms found in disease is caused by alternaria solani. Symptoms appears first on the oldest foliage. Affected leaves develop circular to angular dark brown lesions 3-4 mm in diameter.

**88. Maximum number of fruit plants can be planted in the orchard by the system :**

- (a) Square (b) Triangular  
(c) Hexagonal (d) Rectangular

**Ans. (c) :** The maximum number of fruit plants can be planted in orchard by the system of hexagon.



**89. Which of the fertilizer contains citric acid soluble phosphoric acid?**

- (a) Basic slag  
(b) Rock phosphate  
(c) Single super phosphate  
(d) Triple super phosphate

**Ans. (b) : Types of phosphorous fertilizer**—Phosphorous fertilizers are classified into three main categories.

- (1) **Water soluble**—Single super sulphate or DAP  
(2) **Citric soluble**—Guano bold and rock phosphates  
(3) **Organic soluble**—Manures and compost

**90. Gulabi is important cultivar of:**

- (a) Grape fruit (b) Pomegranate  
(c) Strawberry (d) Litchi

**Ans. (a) :** The Gulabi and Kali champa are the important varieties of grape fruit. Gulabi or Muscult hamburg grapes harvest in the month of January-March and June-December.

**Other varieties—**

**Sultana** - Light green oval shape

**Kal Champa** - For juice and wine purpose

**91. Which of the following element is required by plants for uptake and utilization of calcium?**

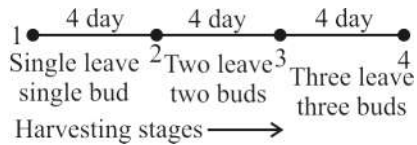
- (a) Manganese (b) Chlorine  
(c) Boron (d) Selenium

**Ans. (c) : Boron (B)**—It is a essential for the uptake and utilization of calcium by plants. It facilitates the movement of calcium into the root zone of plants.

92. **Best harvesting or plucking stage of tea is :**

- (a) Two leaves, two bud stage
- (b) Two leaves, single bud stage
- (c) Single leaves, single bud stage
- (d) All of these

**Ans. (d) : Harvesting or plucking stage of tea**—It is the time interval in days between the successive plucking operations. It varies from 4-14 days.



93. **Which of the weed is controlled by the use of *Zygotropha bicolorata* as a bio-agent ?**

- (a) Prickly pear opuntia
- (b) Xanthoxylum strumarium
- (c) Lantana camara
- (d) Parthenium hysteranthus

**Ans. (d) : Parthenium hysteranthus** is a weed which is controlled by the use of *Zygotropha bicolorata* as a bio-agent.

94. **Inflorescence of Banana is :**

- (a) Spadix
- (b) Comby
- (c) Solitary
- (d) Panicle

**Ans. (a) : Inflorescence of Banana**—Cymose groups of flowers are arranged acropetally on the fleshy axis. Each cymose group is subtended by the spathe, an older spathe subtending the next younger. The mixed spadix is the cymose group of flowers acropetally on fleshy axis of banana which is termed as inflorescence of banana.

95. **Herbicide used to control *Orobanchaeegyptiaca* parasite in Mustard crop is :**

- (a) Pendemethalin and fluchloalin
- (b) Alachlor and bentazon
- (c) Nitrofen and trifluratin
- (d) MSMA and DVA

**Ans. (a) :** Herbicide used to control *Orobanchaeegyptiaca* parasite in Mustard crop is pendemethalin and fluchloalin

96. **Weight of sword sucker in Banana :**

- (a) 250 gm
- (b) 450 gm
- (c) 750 gm
- (d) 800-900 gm

**Ans. (c) : Sucker in Banana**—There are two types of sucker in banana plant—

- 1. Sword sucker – Broad Rhizome
- 2. Water Sucker – Small Rhizome, broad leaves weight of sword sucker lies from 500-750 gm.

97. **Growing only one crop year after year on a piece of land is called :**

- (a) Sole cropping
- (b) Cropping pattern
- (c) Companion cropping
- (d) Mono-cropping

**Ans. (d) : Mono cropping**—Growing only one crop year after year on a piece of land is called as mono cropping

**Sole cropping**—Crop composed of individual plants of the same variety of one species.

**Other cropping system—**

- (i) Alley cropping
- (ii) Inter cropping
- (iii) Mixed cropping
- (iv) Raton cropping
- (v) Sequential cropping

98. **Sindhu seedless cultivar of Mango has which ?**

- (a) vegetative
- (b) Stimulative
- (c) Stenospermocary
- (d) None of these

**Ans. (c) :** Sindhu is seedless mango variety from hybrids of mango varieties has a rich, sweet and distinctive flavour and less fibre than other varieties. The production of abortive development of seed less mango is termed as steno spermocary.

99. **Which of the following is not a Kharif season weed ?**

- (a) *Chenopodium album*
- (b) *Amaranthus viridis*
- (c) *Echinochloa colonum*
- (d) *Commelina Benghalensis*

**Ans. (a) :** Kharif seasoned weed—

- (i) *Amaranthus viridis*
- (ii) *Echinochloa colonum*
- (iii) *Commelina Benghalensis*

*Chenopodium album* is a rabi season weed which is commonly known as 'Bathua' which is a very rich source of vitamin 'A'.

100. **Which cereal crop is having least amount of lysine and tryptophan?**

- (a) Maize
- (b) Rice
- (c) Wheat
- (d) Sorghum

**Ans. (b) :** Rice is a cereal which is having least amount of lysine and tryptophan.

Ex. Maize, rice, wheat, barley, sorghum, millet etc.

**Lysine**—Alpho amino acid

**Tryptophan**— $\alpha$ -amino acid which is used in the biosynthesis of protein.



# Odisha Public Service Commission

## Assistant Soil Conservation Officer (ASCO)

### Exam- 2021 (Paper-II)

1. Aman rice is sown in the month of:  
 (a) April-may (b) June-July  
 (c) November-December (d) May-June

**Ans. (b) :** Aman, boro and aus is the variety of rice which are sown in the month of June-July. In India the percentage production of Aman is 48.79%.

**Climatic condition-**

- (i) Avg. Temperature – (21-37°C)
- (ii) Blooming temperature – (26-29°C)
- (iii) Ripening temperature – (20°-25°C)
- (iv) suitable soil – Clay loam
- (v) pH of soil – 5.5-6.5

**Note**—Boro rice is sown in winter and harvested in summer so that it is known as spring rice.

2. A short duration crop is sown in between the two rows of main crops is termed as :  
 (a) Cash crop (b) Catch crop  
 (c) Companion crop (d) Ephemeral

**Ans. (b) : Catch crop**—The crop which is sown in between the two rows of main crops is termed as catch crops. These are also used for increasing the fertility of soil.

**Cash crop**—The crops which are used to make profit are known as cash. i.e. Sugarcane, cotton etc.

**Companion crops**—When two crops are grown near each other for the benefit of one those crops or both is termed as companion crops.

3. Crop production and, Animal Husbandry collectively is known as :  
 (a) Mixed cropping (b) Relay cropping  
 (c) Mixed Farming (d) None of these

**Ans. (c) : Mixed farming**—The crop production and animal husbandry/rearing simultaneously known as mixed farming. It is different from mixed cropping which is the cultivation of two or more crops simultaneously in a field.

**Relay cropping** = Crop about to harvest + Crops seeding

**Mixed farming** = Crop production + Animal rearing

**Mixed cropping** = Crops + crops at same time.

4. How much area of nursery is needed for sowing of paddy crop in one hectare ?  
 (a) 1/5 of total area (b) 1/10 of total area  
 (c) 1/8 of total area (d) 1/16 of total area

**Ans. (b):** The area required for nursery

A = 1000 sq.m/hectare

$$= \frac{1000 \text{ sq.m}}{10000 \text{ sq.m}}$$

$$= \frac{1}{10} \text{ or total area}$$

**Note**—Generally 800-1000 sq. m. is required for nursery of paddy for 1 hectare

5. Ammonium sulphate Fertilizer is preferred for nitrogen application in ground nut because it also provides :  
 (a) Calcium (b) Magnesium  
 (c) Sulphur (d) Boron

**Ans. (c) :** Ammonium sulphate fertilizer is preferred for ground nut because of both nitrogen and sulphur content.

6. Nitrogen is taken up by the plants in the form of:  
 (a) Chloride (b) Oxide  
 (c) Nitrate (d) Sulphate

**Ans. (c) :** Nitrogen is taken up by the plants in the forms of nitrate for their growth.

7. The deficiency symptoms on lower leaves are seen due to :  
 (a) Nitrogen (b) Phosphorus  
 (c) Potassium (d) Zinc

**Ans. (a) :**

Deficiency symptoms	Nutrients	Location
Whole leaves turn yellow	Nitrogen	Lower leaves
Purple of bronze discoloration in upper and lower side of leaf	Phosphorus	Lower leaves
Browning or yellowing on leaves edges of newly leaves	Potassium	Lower leaves

8. Which one of the following nutrient is more required for berseem crop ?  
 (a) Nitrogen (b) Phosphorus  
 (c) Potash (d) Boron

**Ans. (b):** Phosphorous is more required for barseem crop. Barseem is a leguminous crop so it does not required large amount of nitrogen. Leguminous crops are those which are used to regain the nitrogen content in field by natural means.

9. **Acidic soil can be reclaimed by the application of :**

- (a)  $\text{CaCO}_3$  (b)  $\text{H}_2\text{SO}_4$   
(c)  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$  (d)  $\text{HNO}_3$

**Ans. (a) : Reclamation of soil –**

- (i) Acidic soil – Limestone –  $\text{CaCO}_3$   
(ii) Alkaline soil – Gypsum –  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$   
(iii) Sodic soil – Gypsum –  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

10. **Addition of following material makes it possible to take good crop in sodic soils;**

- (a) FYM (b) Green Manuring  
(c) Gypsum (d) Vermicompost

**Ans. (c) : Sodic soil**–The soil containing high sodium ion concentration as compared to others then the soil is termed as sodic soil. The reclamation of sodic soil can be done with the help of gypsum.

11. **Ammonia is lost through volatilization in significant amount from :**

- (a) Alkaline soils (b) Acidic soils  
(c) Saline soils (d) Sodic soils

**Ans. (b) : Volatilization**–It is the loss of nitrogen through the conversion of ammonium to ammonia gas. Which is released to the atmosphere. As pH of soil increases volatilization losses are increased significantly.

**Acidic soil** – high  $\text{H}^+$  ion

**Alkaline soil** – high  $\text{OH}^-$  ions

**Sodic soil** – high  $\text{Na}^+$  ions

**Saline soil** – high salt concentration

12. **An aerobic environmental condition of paddy soil is responsible for gaseous losses of fertilizer nitrogen :**

- (a) Ammonification (b) Nitrification  
(c) Denitrification (d) Volatilization

**Ans. (c) :** In an aerobic environmental condition of paddy soil which is responsible for losses of fertilizer nitrogen in gaseous form is termed as denitrification.

13. **Application of nitrogen in pulses at the time of sowing is known as :**

- (a) Additional dose (b) Starter dose  
(c) Synergistic dose (d) Basic dose

**Ans. (b) :** The application of nitrogen in pulses at the time of sowing is known as starter dose because pulses with the help of rhizobium bacteria and no further nitrogen does required.

14. **How much  $\text{kgN}_2/\text{ha}/\text{year}$  can be fixed by Azolla?**

- (a) 80 to 100 (b) 30 to 40  
(c) 10 to 15 (d) 100 to 120

**Ans. (d) :** The rate of  $\text{N}_2$  fixation by Azolla is 100-170  $\text{kg}/\text{ha}/\text{year}$ .

15. **What is crop Rotation?**

- (a) Growing more than one crop at a time  
(b) Growing of crops one after another to maintain soil fertility  
(c) Growing of an associate crop in between the rows of two main crop  
(d) Growing of crops together in strips

**Ans. (b) : Crop rotation**–The process of growing crops one after another to maintain the fertility of soil is called as crop rotation.

- Growing more than one crop at same time – Mixed cropping
- Growing of an associate crop in between the rows of two main crops – Catch crops
- Growing of crops together in strips – Strips cropping

16. **Which is the most important source of Irrigation in India ?**

- (a) Canal (b) Pond  
(c) Tubewell (d) Charsa

**Ans. (c) :** The most important source of irrigation in India is tubewells. It is about to 46% of total.

17. **When only two irrigations are available, the wheat crop should be irrigated at ?**

- (a) CRI and Tillering stage  
(b) CRI and Flowering stage  
(c) CRI and Milking stage  
(d) CRI and late joining stage

**Ans. (b) :** When only one irrigations is available then the wheat crop should be irrigated at crown root initiation (CRI) and when two irrigations is available then it is provided at crown root initiation and flowering stage.

18. **Which crop is Considered as King of the fodder Crop ?**

- (a) Lucem (b) Berseem  
(c) Oat (d) Sudan grass

**Ans. (b) :** Berseem (*Trifolium alexandrium*) is a major fodder crop and it is considered as king of fodder crop. It is a leguminous crop.

19. **Which of the following operation is not a primary practice ?**

- (a) Ploughing (b) Planking  
(c) Harrowing (d) Weeding

**Ans.(c): Primary tillage**—These operations which consume more power per unit area in order to prepare the soil for seeding and planting is termed as primary tillage.

Ex.: Ploughing, Planking, Weeding etc.

**Secondary tillage**—These operations which consume less power per unit area is termed as secondary tillage.

Ex.: Cultivators, Harrow, Rollers.

**20. Phalaris minor weed is associated with:**

- (a) Gram crop (b) Wheat crop  
(c) Paddy crop (d) Soybean crop

**Ans. (b) :** Phalaris minor weed is a major weed of wheat crop. The intensity of this weed is so high that it has become rather impossible to grow wheat generally in certain localities it is called as Gehunsa.

**Control**—To control phalaris minor tribunil or dosonex or isoproturon is sprayed over wheat crops after 32-35 days of sowing.

**21. Basal application of fertilizers means :**

- (a) Application of fertilizers at the time of sowing  
(b) Application of fertilizers in two split doses  
(c) Application of fertilizers in sending Crop  
(d) Application of fertilizers many times

**Ans. (a) :** Application of fertilizers at the time of sowing is termed as basal application which is done to obtain maximum crop yield.

**22. Bio fertilizer is a:**

- (a) Mixture of organic matter and micro organisms  
(b) Mixture of inorganic fertilizers and micro organisms  
(c) Culture having the desired strain of micro organisms  
(d) Decomposed organic matter enriched with bacteria

**Ans. (a) :** **Biofertilizer**—These are biological preparation of efficient microorganisms that promote plant growth by improving nutrient acquisition.

**23. Biological Nitrogen fixation is :**

- (a) Aerobic and anaerobic  
(b) Denitrification  
(c) Leaching  
(d) Removal

**Ans. (a) :** **Biological Nitrogen fixation**—These bacteria that convert atmospheric nitrogen into utilizable compound of nitrogen are known as nitrogen fixing bacteria.

Azotobacter is aerobic and clostridium is anaerobic nitrogen fixing bacteria.

**24. Capillary movement of water in the soil is complemented by :**

- (a) Stem Elongation (b) Root Extension  
(c) Leaf Orientation (d) Fruit formation

**Ans. (b) :** The water which is useful for plant growth is called as capillary water. The movement of water and minerals from soil to the plant is possible through the root extension of plants due to capillary action.

**25. Topping in tobacco crop means a process of :**

- (a) Removal of buds in the axil of Leaves  
(b) Removal of leaves  
(c) Removal of terminal buds  
(d) Burning of leaves

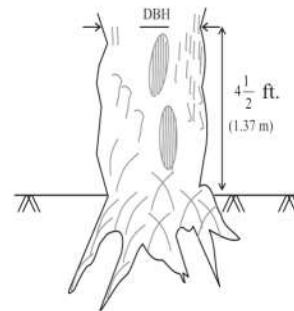
**Ans. (a) :** The removal of buds in the axil of leaves of tobacco crop is called as topping and the process of drying the leaves is called as curing.

Tobacco is obtained from the leaves of the 'Nicotiana species.'

**26. Diameter of Breast Height (DBH) Of tree is measured at :**

- (a) 4½ feet above ground level  
(b) Merchantable height of the tree  
(c) 1.37 meter from the ground level  
(d) Just below the canopy of the tree

**Ans. (a) :** The Diameter of Breast Height (DBH) of the tree is measured at 4.5 feet (1.37 m) above the ground level.



**27. Tree species which give fuel, fodder, food, fruit and fiber are called :**

- (a) Fodder Trees  
(b) Multipurpose Trees  
(c) Agroforestry Trees  
(d) Leguminous Trees

**Ans. (b) :**

Trees	Uses
• Multipurpose Trees –	Fuel, fodder, food, fruit, fiber, fertilizers
• Fodder Trees –	Food for animals
• Agroforestry Trees –	Agricultural + forest plant
• Leguminous Trees –	Nitrogen fixation



28. A tree which completely becomes leafless in rainy season is :

- (a) Faiderbia albida
- (b) Prosopis juliflora
- (c) Leucaena leucocephala
- (d) Acacia nilotica

Ans. (\*) :

29. Which is the scented portion in Sandal wood ?

- (a) Flower
- (b) Seed
- (c) Soft wood
- (d) Heart Wood

Ans. (d) : Heart wood is the scented portion of the sandal wood. It is the most precious part of sandal wood tree. The unique smell comes from a naturally occurring compound  $\alpha$ -santalol ( $C_{15}H_{24}O$ )

30. Tree age can be measured by:

- (a) Altimeter
- (b) Increment borer
- (c) Hygrometer
- (d) Relascope

Ans. (b) : The age of tree can be measured by increment borer foresters use tree borers to extract core samples from trees to determine age and growth rate.

- Altimeter – Height of aeroplanes
- Hydrometer – Humidity
- Relascope – Height of tree and basal area

31. Head Quarter Of ICRAF is located at:

- (a) Dehredun
- (b) Jhansi
- (c) Nairobi
- (d) Europe

Ans. (c) : ICRAF – International Centre for Research in Agro forestry (1978)

It is an international institute headquartered in Nairobi. (Kenya)

32. Global warming is due to:

- (a) Deforestation
- (b) Mixed farming
- (c) Crop diversity
- (d) Agroforestry

Ans. (a) : **Global warming**—The global annual temperature has increased due to release of green house gases into atmosphere. Deforestation is the main cause of global warming because it causes more increase in % of  $CO_2$  into atmosphere.  $CO_2$  absorbs the sunlight and create a thermal blanket and average temperature increases.

33. Which of the following tree species is not nitrogen fixing?

- (a) Acacia nilotica
- (b) Dalbergia Sissoo
- (c) Azadirachta Indica
- (d) Leucaena Leucocephala

Ans. (c) : Azadirachta Indica which is commonly known as Neem is not nitrogen fixing tree species as compare to other given options.

• Nitrogen fixing tree

- Acacia Nilotica (Babul)
- Dalbergia sissoo (Sheesham)
- Leucaena leucocephala

34. Sal tree bears flower:

- (a) Every year
- (b) Once in two years
- (c) Once in five years
- (d) None of these

Ans. (a) : The sal flowers are whitish and yellowish in colour which appear in every summer season.

35. The criteria of essentiality of nutrients is given by :

- (a) Amon
- (b) Tandon
- (c) Rattan
- (d) Dargan

Ans. (a) : The channels that are termed necessary essential for plants without which the processes and life cycle of plant is incomplete, are categorised in to various groups.

The criteria for essentiality was given by Amon and stout in 1939. There are 17 essential element have been found for growth and metabolism of plants.

36. In Alley Cropping, the row to row spacing varies from:

- (a) 1-4m
- (b) 4-8m
- (c) 2-4m
- (d) 4-6m

Ans. (d) : **Alloy cropping**—It is defined as the planting of rows of tree and shrubs to create alley. The row to row spacing varies from (4-6)m.

37. Home garden is found extensively in:

- (a) Low rainfall areas
- (b) Medium rainfall areas
- (c) High rainfall areas
- (d) Arid areas

Ans. (c) : **Home garden agriculture**—A farming system that combines different physical, social and economical function in the land area around the family home.

Tomatoes, peppers, garlic, cucumber, peas, etc. are the plants widely used in home gardens. Home gardens are found in highly rainfall areas.

38. The mature trees removed in one operation is called :

- (a) Shelter wood system
- (b) Clear Felling system
- (c) Improvement Felling
- (d) Coppice with Reserve System

Ans. (b) : **Clear felling system**—It is defined as a silviculture system in which equal or equi-productive area of a mature crops are successively clear felled in one operation to be regenerated, most frequently artificial but naturally also.

**Shelter wood system**—The shelterwood system is the system in which the mature crop is removed in a series of operations. The first operation is called seeding felling and last is the final felling.

39. **Katha is extracted from which part of Khair trees ?**

- (a) Fruit (b) Heart Wood  
(c) Seed (d) Roots

**Ans. (b) :** Katha is obtained by boiling the heartwood of acacia catechu which is generally called as "Khair tree". The process of katha making is a long and arduous process which takes up to 45 days time period.

40. **For cooking 1 kg of food, how much quantity of fuel wood is required ?**

- (a) 1 kg (b) 1.2 kg  
(c) 1.5 kg (d) 1.7 kg

**Ans. (b) :** For cooking 1 kg of food the amount of the fuel wood of 1.2 kg is required. Fuel wood is also known as fire wood which is commonly used for known as fire house hold cooking operations.

41. **An operation is carried out for the benefit of a forest crop at any stage between seedling to maturity, is called :**

- (a) Cultural operation (b) Plant protection  
(c) Regeneration (d) Tending Operations

**Ans. (d) :** **Tending**—An operation is carried out for the benefit of forest crop at any stage between seedling to maturity is termed as tending operations.

**Cultural operations**—These are carried out to assist the crop to complete regeneration. If some operation done before planting or sowing is done it will also be cultural operation. There is no income generated from cultural operation.

**Regeneration**—The natural process of replacing or restoring of missing cells, tissues organs, and entire plant body is termed as regeneration.

42. **Which is the most important physical characteristics of wood ?**

- (a) Strength (b) Grain  
(c) Specific gravity (d) Elasticity

**Ans. (c) :** The fundamental physical property of wood is specific gravity. The hardwoods have a specific gravity ranging from (1-1.54).

**Strength**—Maximum strength in the direction of fibers tensile strength 0.1 N/mm<sup>2</sup>. Shear strength 0.15 N/mm<sup>2</sup>.

43. **First Inspector General of Forest of India was :**

- (a) K.F.S. King (b) H.G. Champion  
(c) R.S. Troop (d) Dietrich Brandis

**Ans. (d) :** Dietrich Brandis was the first Inspector General of forests in India. He helped the Britishes to formulate the Indian forest services act 1865.

44. **World Forestry Day is celebrated on date :**

- (a) 5th June (b) 15th June  
(c) 22nd March (d) 25th September

**Ans. (\*) :**

Days	Importance
21 <sup>st</sup> March	World forestry day
5 <sup>th</sup> June	World environment day
15 <sup>th</sup> June	World wind day
25 <sup>th</sup> September	Antyoday Diwas

45. **Growing of trees with the crop is called :**

- (a) Agri-silviculture-System  
(b) Agri-horticulture system  
(c) Agro-silvopastoral System  
(d) Agro-horti-silviculture System

**Ans. (a) :**

Agri - silviculture – Crop + forestry  
Agro - horticulture – Crop + Grass or ornamental plant  
Agro - silvopastoral – Crop + tree + animals  
Agro - horti - silviculture – Crop + fruits + ornamental trees

46. **Silvipastoral system means.**

- (a) Growing of trees with pasture  
(b) Growing of trees with crop  
(c) Growing of grasses with fruit tree  
(d) Growing of pasture + crop

**Ans. (a) :** **Silvipastoral system**—The combined production of woody plants with pasture is termed as silvipastoral system. The trees and shrubs used primarily to produce fodder for live stock.

Silvipastoral – Tree + Pasture/animals

47. **The ideal patting mixer used in filling polybags for raising seedlings contains ratio of Soil : Sand : FYM :**

- (a) 1:3:1 (b) 1:2:1  
(c) 1:1:1 (d) 2:1:1

**Ans. (d) :** The ideal patting mixer used in filling polybags for raising seedling contains two part of fine earth/soil, one part of sand and one part of FVM to improve aeration and fertility of the soil.

**FYM**—Organic fertilizer which stands for farm yard manure.

48. **Which of the following is an example of Silvipastoral System ?**

- (a) Hardwickkia binate + Cenchrus Ciliaris + Goat  
(b) Eurblica officinalis + Cowpea  
(c) Gmelina arborea + Dicanthium annufatum  
(d) Acaica nilotica + Paddy

**Ans.(a):Silvipastoral system**–A agroforestry arrangement that combines fodder plant (i.e. grasses leguminous herbs) with shrubs (plants) and trees for animal nutrition and complementary uses.

**49. Raising of trees on bunds or farm boundaries is known as :**

- (a) Social Forestry
- (b) Community Forestry
- (c) Farm Forestry
- (d) Extension Forestry

**Ans. (c) :Types of social forester–**

**(1) Farm forestry**–Raising of tree on bunds or farm boundaries is known as farm forestry.

**(2) Community forestry**–The planning, managing and harvesting of forest crops by the local population in order to encourage the involvement of locals is termed as community forestry.

- (3) Agro-forestry
- (4) Extension forestry
- (5) Scientific or Silviculture

**50. Central Agroforestry Research Institute (CAFRI) is located at :**

- (a) Hyderabad
- (b) New Delhi
- (c) Jhansi
- (d) Solan

**Ans. (c) :** Central Agroforestry Research Institute (CAFRI) was established on 8<sup>th</sup>, May 1988 at Jhansi (Uttar pradesh) in order to strengthen and coordinate the agroforestry research.

Now it is upgraded on 2014 as Central Agroforestry Research Institute (CARI)

**51. The putting of plant propagules in the field to grow as crop plants is called :**

- (a) Sowing
- (b) Gap filling
- (c) Planting
- (d) Transplanting

**Ans. (d) : Planting**–The putting of seeds or propagules in the field to grow as crop plants is called planting.

**Transplanting**–The method in which planting of seedlings in main field after pulling out from the nursery to grow as crop.

**Sowing**–Seeds are placed into the furrows continuously or at specific distance.

**52. Which of the following method of sowing gives rapid and uniform germination with good seedling vigour?**

- (a) Broadcasting
- (b) Dibbling
- (c) Drilling
- (d) Line sowing

**Ans. (b) : Methods of sowing–**

**(i) Dibbling**–In this method seeds are placed in holes or pits at equal predetermined distances and depth which gives rapid and uniform germination with good seedling vigour.

**(ii) Broadcasting**–The most common and oldest method of sowing in which seeds are spread over the soil. It may covered or in covered with soil.

**(iii) Drilling**–In this method seeds are dropped into the holes, then covered and compacted by soil with the help of seed drill.

**(iv) Planting**

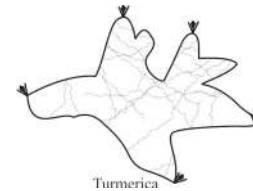
**(v) Transplanting**

**(vi) Sowing**

**53. For the planting of turmeric crop, which of the following vegetative material is used ?**

- (a) Tubers
- (b) Bunches
- (c) Setts
- (d) Rhizomes

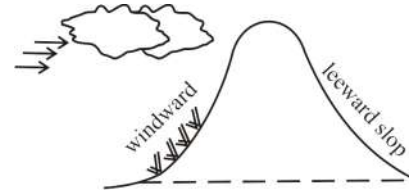
**Ans. (d) :** For the planting of turmeric crop, rhizomes is used which is a modified subterranean plant stem that sends out roots and shoots from its nodes. It is also known as creeping root stalks.



**54. Maximum rainfall occurs on the :**

- (a) Leeward side
- (b) East-West Direction
- (c) North-South Direction
- (d) Windward side

**Ans. (d) :** The windward slope of the mountain receives maximum rainfall and leeward slope remains drier so that it is also known as rain shadow zone.



**55. The optimum range of temperature required for the grain formation in Wheat crop is :**

- (a) 8 to 10°C
- (b) 10 to 12°C
- (c) 12 to 26°C
- (d) 5 to 10°C

**Ans. (c) :** The optimum range of temperature means the temperature at which grain formation of crop is maximum. For wheat crop the optimum range of temperature lies between 12°C-26°C.

**56. Which of the statement is not related to deep ploughing ?**

- (a) Favours break up of clots
- (b) Kills the weeds
- (c) Increases soil erosion
- (d) Incorporates organic residues

**Ans. (a): Deep ploughing**—The ploughing more than 50 cm is termed as deep ploughing which is done to change the soil water retention and to kill the weeds. Deep ploughing causes more soil erosion and incorporates organic residues that present over the surface of field.

Break up of clots is done by leveller after ploughing.

57. Which of the following instrument is not used for ploughing ?

- (a) Country Plough
- (b) Mould Board Plough
- (c) Ridge Plough
- (d) Disc Plough

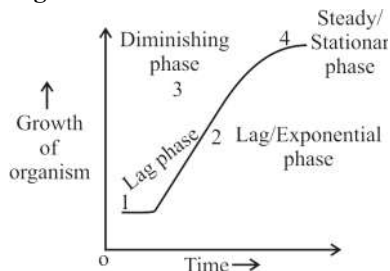
**Ans. (a) :** Instruments used for ploughing.

- Mould Board plough
- Ridge plough
- Disc plough

58. Find the odd one out-In Sigmoid Growth Curve, there are three well marked regions :

- (a) Lag phase
- (b) Economic phase
- (c) Log phase
- (d) Steady state phase

**Ans. (b) : Sigmoid Growth Curve—**



59. Which one of the following operation is not helpful in controlling floods ?

- (a) Construction of dams
- (b) Afforestation
- (c) Provision of adequate drainage
- (d) Deforestation

**Ans. (d) :** Loss of vegetation, which is known as deforestation causes more chances of flooding. So that deforestation is not a flood controlling operation.

**Flood controlling operation—**

- (i) Construction of dams
- (ii) Afforestation
- (iii) Provision of adequate drainage
- (iv) Development of canals

60. Which of the following are not related to greenhouse gases ?

- (a) Methane
- (b) Carbondioxide
- (c) Chlorofluoro carbons
- (d) NO<sub>3</sub>

**Ans. (d) : Green house gases—**

- (i) Methane CH<sub>4</sub>
- (ii) Carbon dioxide CO<sub>2</sub>
- (iii) Chlorofluoro carbons (CFC)

(iv) Nitrus oxide N<sub>2</sub>O

These are major green house gases which are mainly responsible for global warming and ozone layer depletion.

61. Absorption of which of the following gas reduces the level Of chlorophyll pigments in cell and affects photosynthesis ?

- (a) CO<sub>2</sub>
- (b) SO<sub>2</sub>
- (c) NO<sub>2</sub>
- (d) NH<sub>3</sub>

**Ans. (b) :** Sulphur dioxide SO<sub>2</sub> is a major air pollutant and plants are mainly sensitive to SO<sub>2</sub> because the process of photosynthesis is mainly affected by the increased concentration of sulphur dioxide and leaves became yellow due to reduced level of chlorophyll pigments in cells.

62. Quantity, Quality, Intensity and Duration are the important parameters of :

- (a) Soil Temperature
- (b) Rain Fall
- (c) Solar Radiation
- (d) Soil Moisture

**Ans. (b) :** Quantity, quality, intensity and duration are the important parameter of rain fall which is mainly affects the growth of crops.

**Rainfall—**

**Quantity—** Amount of water required for crops

**Quality—** Acidic, Alkali, neutral water

**Intensity—**Rate of rainfall

**Duration—**Time interval

63. The science of identification and classification of earth surface features using electromagnetic radiation as a medium of interaction refers to :

- (a) Weather Forecasting
- (b) Remote Sensing
- (c) Geographic Information System
- (d) Global Positioning System

**Ans. (b) : Remote sensing**—The science of identification and classification of earth surface feature using electro-magnetic radiation as a remote sensing.

**Weather forecasting**—Prediction of conditions of atmosphere.

**GIS**—Computer system for geographic information.

**GPS**—Navigation system (satellite based radio navigation)

64. The process of destruction of soil aggregates by mechanical force in soils with a moisture content exceeding the moisture equivalent :

- (a) Puddling
- (b) Ploughing
- (c) Mulching
- (d) Intercultivating

**Ans. (a) : Puddling**—The process of destruction of soil aggregates by mechanical force in soils with a moisture content exceeding the moisture equivalent is termed as puddling.

**Intercultivating**—A process operations in the rows of standing crop. Weedings, tilting and cultivating are the examples of intercultivation.

**Ploughing**—Ploughing is the process of turning over the uppermost soil, bringing fresh nutrients to the surface while burying weeds and crop remains for decaying.

**Mulching**—The process of covering the open surface of ground by some materials in order to prevent the growth of weeds near the plants.

65. In urea, the nitrogen is available in :

- (a) Nitrate form (b) Sulphate form  
(c) Amide form (d) Ammonium form

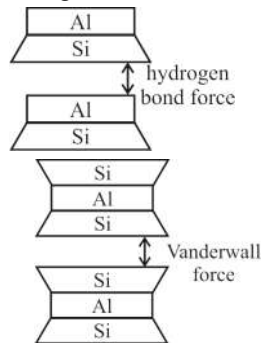
**Ans. (c) :** Urea in a organic matter which is produced in lab. It is a source fo nitrogen for the plants. Nitrogen present in urea in the form of amide.

Urea  $\rightarrow$   $\text{NH}_2\text{CO NH}_2$

66. The maximum Anion Exchange Capacity is found in :

- (a) Kaolinite mineral  
(b) Montmorillonite mineral  
(c) Granite mineral  
(d) Basalt mineral

**Ans. (a) :** Anion exchange capacity—It is found maximum in kaolinite mineral (43 me/100g) and (5 me/100g) montmorillonite minerals. Anion exchange property is useful for crops in order to extract phosphose for their growth



67. Castor belongs to the family:

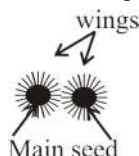
- (a) Leguminoceae (b) Euphorbiaceae  
(c) Cruciferae (d) Compositae

**Ans. (b) :** Castor oil plant is belongs to euphorbiaceae which is also called caster bean. It is useful for pharmaceutical and industrial use.

68. The removal of wings from the seeds is called :

- (a) Deheading (b) Dewinging  
(c) Washing (d) Cleaning

**Ans. (b) :** The removal of wings of seeds is called as dewinging. These seeds are transported by wind but



If wind velocity increases this wings are being removed from seeds. Generally wings are white and seeds are black or dark brown in colour.

69. The removal of seeds in case of flashy fruits is called :

- (a) Depulping (b) Extraction  
(c) Soaking (d) Winnowing

**Ans. (b) :** The flashy part of a fruits is called the mesocarp. It is a eatable part of fruit and the removal of seeds in case of flashy fruits is called extraction.

**Depulping**—Removal of pulp

**Winnowing**—Removal of chaff from grain

**Soaking**—Deep into water

70. The decomposition of litter (Leafy matter) is faster in case of :

- (a) Narrow leaves (b) Pointed leaves  
(c) Broad leaves (d) Wax-coated leaves

**Ans. (c) :** Leaf litter decomposition occurs at faster rate in case of tropical rain forests, which have broad leaves.

71. Which of the statement is not related to deep ploughing ?

- (a) Favors break-up of clots  
(b) Kills the weeds  
(c) Increases soil erosion  
(d) Incorporates organic residues

**Ans. (a) :** Repeat Q. 56

72. The natural geo-hydrological unit whereby all streams are draining into a common point is called :

- (a) Water conservation  
(b) Water shed management  
(c) Soil conservation  
(d) Dug wells

**Ans. (b) :** Water shed management—The natural geo hydrological unit whereby all streams are draining into a common point is called as water shed.

**Water conservation**—Protection of water losses.

**Soil conservation**—Prevention of soil erosion.

73. The science which deals with water, concerning with distribution, physical and chemical reaction and in relation to the life of the earth :

- (a) Precipitation (b) Flooding  
(c) Hydrology (d) Agrostology

**Ans. (c) :** Hydrology—The science which deals with water concerning with distribution, physical and chemical reaction and in relation to the life of the earth is known as hydrology.

**Precipitation**—Rainfall/snow fall

**Flooding**—Uncontrolled discharge of water

**Agrostology**—Study of grasses

74. The removal of thin uniform layer of soil from the land surface by the action of runoff water is called:

- (a) Splash erosion (b) Sheet erosion  
(c) Rill erosion (d) Gully erosion

**Ans. (b) : Sheet erosion**—The removal of thin uniform layer of soil from the land surface by the action of runoff water is called sheet erosion of the soil.

**Splash erosion**—The removal of soil particles due to rain drops is called splash erosion

**Rill erosion**—The loss of soil from small channels or rills by runoff water is called rill erosion.

**Gully erosion**—The formation of gullies due to excessive rill erosion is called as gully erosion.

75. The making of small depressions of about 10-15 cm depth around the vegetation before sowing of crop is called :

- (a) Bunding (b) Bench terracing  
(c) Basin listing (d) Graded buns

**Ans. (c) :** The making of small depression of about 10-15 cm depth around the vegetation before sowing of crop is called as basins.

**Bunding**—The process of water retention and prevention of soil erosion through a spur or bunds of small height is called as bunding.

76. The weeds which normally start and complete their life-cycle on the land is called:

- (a) Alien weeds (b) Obligate weeds  
(c) Parasitic weeds (d) Terrestrial weeds

**Ans. (d) :** The weed which normally start and complete their life cycle on the land is called as terrestrial weeds.

**Other types of weed—**

1. Perennial weeds
2. Broad leaf weeds
3. Herbaceous weeds
4. Parasitic weeds
5. Crop-associated weed
6. Alien weed
7. Facultative or obligate weeds
8. Noxious weed etc.

77. A weeds that has become an integral part of a crop-ecosystem is called:

- (a) Facultative weeds (b) Satellite weeds  
(c) Associated weeds (d) Noxious weeds

**Ans. (b) :** The weeds that has become an integral part of a crop-ecosystem is called satellite weeds.

**Facultative weeds**—Those weed species that grow primarily in wild communities but often escape to cultivated field, associated themselves closely with men's affairs. These are also known as apopytes.

**Noxious weeds**—It is a plant arbitrarily defined as being especially undesirable, troublesome and difficult to control.

78. The direct or indirect harmful effect by one plant on another through the production of inhibitory substances is called :

- (a) Allelopathy (b) Competition  
(c) Stimulation (d) Interaction

**Ans. (a) :** The direct or indirect harmful effect by one plant on another through the production of inhibitory substances is called as allelopathy.

79. The living organisms (bio-agent) used to limit the infestation of Parthenium Hysterophorus weed is :

- (a) Cactoblastic Cactorum  
(b) Crylophagous salvinia  
(c) Zygomata bicolorata  
(d) Delias hypareta

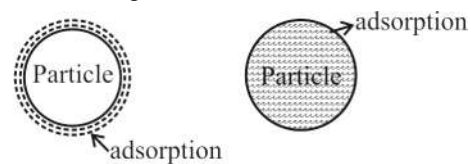
**Ans. (c) : Zygomata bicolorata**—A living organism (bio-agent) used to limit the infestation of parthenium hysterophorus weed is called as zygomata biocolorata.

80. The process by which a herbicide passes from one system to another system is called:

- (a) Adsorption (b) Formulation  
(c) Incorporation (d) Absorption

**Ans. (d) :** The process by which a herbicide passes from one system from another system is called absorption.

**Adsorption**—The process of film formation on the surface of particle by herbicides or any other substance is termed as adsorption.



81. The Lucknow-49 is a variety of:

- (a) Mango (b) Guava  
(c) Amia (d) Ber

**Ans. (b) :** Lucknow-49 is a variety of guava. These fruits are spherical and meaty, seeds are soft and in plenty, pulp is white and contains 130 mg vitamin per 100 gm pulp.

**Pulp**—The fleshy part of fruit which is between outer layer and seeds.

82. Growing of two or more crops on the same field per year, where the succeeding crop is planted after the preceding crop has been harvested is called:

- (a) Multiple cropping  
(b) Relay cropping  
(c) Sequential cropping  
(d) Ratoon cropping

**Ans.(c): Sequential cropping**—Growing of two or more crops on the field where the succeeding crop is planted after the preceding crop has been harvested is called as sequential cropping.

**Relay cropping**—Growing of two or more crop on the same field before the harvesting of succeeding crop is called as relay cropping.

**Multiple cropping**—Growing of many crop at a same field in a year is called multiple cropping.

**83. The quantity of water required by a crop in a given period of time of their normal growth under field condition is called:**

- (a) Water requirement
- (b) Irrigation requirement
- (c) Consumptive use of water
- (d) Irrigation frequency

**Ans. (c) : Consumptive use of water**—The amount of water required by a crop in a crop period for their normal growth under field condition is called as consumptive use of water. It does not contains evaporation and infiltration of irrigation water from the field.

**84. When fertilizers are applied close to the seed or plant which is adopted when relatively small quantity of fertilizer has to be applied for widely spaced crop is called:**

- (a) Deep placement
- (b) Localized placement
- (c) Drill placement
- (d) Band placement

**Ans. (b) : Localized placement**—When fertilizers are applied close to the seed or plant which is adopted when relatively small quantity of fertilizer has to be applied for widely spaced crop is called as localized placement.

**Deep placement**—Application of fertilizer in the reduced zone to avoid nitrogen losses in lowland rice.

**Drill placement**—When drilling seed and fertilizer simultaneously at the time of sowing is known as drill placement or contact placement.

**85. When the fertilizer solutions of low Concentrations prepared for soaking seeds or dipping roots of seedlings for early establishment is called:**

- (a) Foliar application
- (b) Soil application
- (c) Starter solutions
- (d) Fertigation

**Ans. (c) : Application of fertilizers in liquid form.**

**Starter solution**—When the fertilizer solution of low concentration prepared for soaking seeds or dipping roots of seedlings for early establishment is called starter solution.

**Foliar application**—Application of fertilizer in liquid for though spray on standing crops for quick recovery from deficiency.

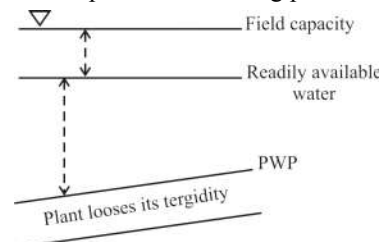
**Soil application**—Direct application of liquid fertilizer to the soil need special injecting equipment.

**Fertigation**—Application of fertilizer with irrigation water in either open or closed system.

**86. The moisture of the soil at which plants can no longer obtain enough moisture to meet the transpiration requirement and water is held by soil so tightly as thin film around soil particles is called:**

- (a) Field capacity
- (b) Available moisture
- (c) Permanent Wilting Point
- (d) Water-holding capacity

**Ans. (c) : Permanent wilting point**—The moisture of the soil which plants can be longer obtain enough moisture to meet the transpiration requirement and water is held by soil so tightly as thin film around soil particles is called permanent wilting point.



**87. The downward movement of water through saturated soil when water is under pressure and tension is less than  $\frac{1}{2}$  atmosphere is called:**

- (a) Percolation
- (b) Water intake
- (c) Permeability
- (d) Seepage

**Ans. (a) : Percolation**—The downward movement of water through saturated soil when water is under pressure and tension is less than  $\frac{1}{2}$  atmosphere is called as percolation.

**Seepage**—The horizontal movement of water through saturated soil under pressure.

**Permeability**—The movement of water through interconnected voids is called as permeability.

**88. The scientist who has given the concept of Law of Minimum :**

- (a) Mitscherlich (1909)
- (b) Justusvon Liebig (1840)
- (c) Blackman (1005)
- (d) Wilkrox(1942)

**Ans. (b) : Law of minimum**—It is a law which described how to plant growth relied on the scarcest nutrient resource rather than the total amount of resource available. This is given by Justusvon Liebig in 1840.

89. Plant that grows on extremely dry soil are classified under :

- (a) Thalophytes (b) Hydrophytes  
(c) Xerophytes (d) Hydroponics

**Ans. (c) :**

Xerophytes – Extremely dry soil

Thalophytes – Dry and moist soil

Hydrophytes – Water

Hydroponics – Technique of growing plant using water

Halophytes – Saline soil

90. The C:N ratio, of humus is:

- (a) 20 : 1 (b) 100 : 1  
(c) 10 : 1 (d) 400 : 1

**Ans. (c) : C:N Ratio**—Carbon to Nitrogen ratio for humus C : N ratio is 10 : 1 generally it varies from (8–15) : 1

91. Cutting of green branches and leaves of a tree for feeding the cattle is known as :

- (a) Lopping (b) Pruning  
(c) Pollarding (d) Thinning

**Ans. (a) : Lopping**—Cutting of green branches and leaves of a tree for feeding the cattle is known as lopping.

**Pruning**—Removal of live or dead branches or multiple leaders standing trees for the improvement of the tree or its timber.

92. In the pellet method of sowing, the homogeneous paste is prepared in the ratio :

- (a) 3 : 1 : 1 : 1 (b) 1 : 2 : 1 : 3  
(c) 2 : 1 : 1 : 2 (d) 4 : 1 : 2 : 1

**Ans. (\*) :**

93. The optimum depth of sowing of grasses in the rangeland should be :

- (a) 3 to 5 cm (b) 5 to 7 cm  
(c) 0.5 to 1 cm (d) 2 to 4 cm

**Ans. (c) :** The optimum depth of sowing of grasses in the range land should be 0.5 cm-1 cm. The thumb rule for optimum depth is 5 times the diameter of seeds.

94. Which method is used for the entire plant removal of scattered shrubs or tree seedlings of small diameter?

- (a) Grubbing (b) Girding  
(c) Chopping (d) Mowing

**Ans. (a) : Grubbing**—The method which is used for removal of entire plant, scattered shrubs or tree seedling of small diameter is called grubbing.

95. The reasons of enormous increase in the livestock population of the country is :

- (a) Availability of green fodder  
(b) Social attitude of people  
(c) Multiple uses of animals  
(d) Large number of family members

**Ans. (c) :** The reasons of enormous increase in the livestock population of the country is the multiple uses of animals i.e. wool, milk, meat, eggs, etc.

96. The characteristics of tree species for Shelter belt is :

- (a) Nitrogen fixing (b) Fast growing  
(c) Profused branching (d) Deep rooted

**Ans. (c) :** The tree species for shelter belt should have profused branching which means repeated branching of trees. So that vertical growth will prevent. The presence of numerous branches is desirable agronomic feature of fodder crops.

**Shelter belts**—This is a row of trees along fence line. they are planted to protect animals or crops from cold winds and give shade in hot weather.

97. Mulching is useful for:

- (a) Conserving moisture  
(b) Reducing crop growth  
(c) Nutrient depletion  
(d) High evaporation

**Ans. (a) : Mulching**—The process of covering the soil surface in order to conserve the moisture and prevent the weed growth near the vegetation or plants.

98. The growth of seedling destroyed by animals is due to :

- (a) Browsing (b) Grazing  
(c) Trampling (d) Up-rooting

**Ans. (c) : Trampling**—The growth of seeding destroyed by animals is trampling and then by grazing when crop grow few centimeters above the ground.

99. Which is not the component of agro forestry?

- (a) Land (b) Animal  
(c) Tree (d) Water

**Ans.(d):** There are three main components of agro forestry

- (1) Animal  
(2) Crops/land  
(3) Trees

• Water is not a main component of agroforestry.

100. The tree species suitable for bio drainage in the water logged areas :

- (a) Eicane (b) Allanthus exceisa  
(c) Albizia procera (d) Gmelina arborea

**Ans. (\*) :**





# Odisha Public Service Commission

## Assistant Engineer (AE) Exam-2020

1. The radius of Mohr's circle for two equal unlike principal stresses of magnitude  $P$  is :
- (a)  $p$  (b)  $p/2$   
 (c) Zero (d) None of these

**Ans. (a) :** Radius of Mohr's circle

$$r = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2} \quad [\text{Given, } \sigma_x = p, \sigma_y = -p, \tau_{xy} = 0]$$

$$\text{Then, } r = \sqrt{\left(\frac{p - (-p)}{2}\right)^2 + 0}$$

$$r = \sqrt{\frac{(2p)^2}{4}} = \sqrt{\frac{4p^2}{4}} = p$$

2. Rate of change in Bending Moment is equal to :
- (a) Shear force (b) Deflection  
 (c) Slope (d) Rate of loading

**Ans. (a) :** Rate of change of bending moment along the length of beam is equal to shear force.

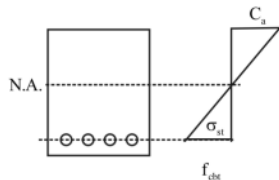
$$\frac{dm}{dx} = S_x$$

Rate of change of shear force is equal to the load

$$\frac{ds}{dx} = w, \quad w = \text{load per unit length}$$

3. The maximum compressive stress at the top of a beam is  $1,600 \text{ kg/cm}^2$  and the corresponding tensile stress at the bottom of the beam is  $400 \text{ kg/cm}^2$ . If the depth of the beam is  $10 \text{ cm}$ , the neutral axis from the top is at :
- (a)  $2 \text{ cm}$  (b)  $4 \text{ cm}$   
 (c)  $6 \text{ cm}$  (d)  $8 \text{ cm}$

**Ans. (d) :** From stress relation (from stress diagram)



$$\frac{C_a}{x_a} = \frac{t_a/m}{d - x_a} = \frac{f_{cbt}}{D - x_a}$$

$$C_a = 1600 \text{ kg/cm}^2$$

$$D = 10 \text{ cm}$$

$$f_{cbt} = 400 \text{ kg/cm}^2$$

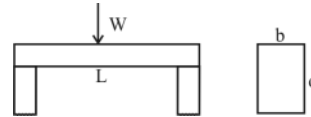
$$\frac{1600}{x_a} = \frac{400}{10 - x_a}$$

$$16000 - 1600 x_a = 400 x_a$$

$$x_a = \frac{16000}{2000} = 8 \text{ cm}$$

4. If the depth of simply supported beam carrying an isolated load at its centre, is doubled the deflection of the beam at its centre will be changed by a factor of :
- (a) 2 (b)  $1/2$   
 (c) 8 (d)  $1/8$

**Ans. (d) :** Deflection at centre of a s/s beam is given as



$$\delta = \frac{WL^3}{48EI} = \frac{WL^3 \times 12}{48Ebd^3} = \frac{WL^3}{4Ebd^3}$$

$$\delta_1 = \frac{WL^3}{4bEd_1^3}$$

For  $d_2 = 2d_1$

$$\delta_2 = \frac{WL^3}{4bEd_2^3} = \frac{WL^3}{4bE(2d_1)^3} = \frac{\delta_1}{8}$$

5. For a given material Young's modulus is  $200 \text{ GN/m}^2$  and modulus of rigidity is  $80 \text{ GN/m}^2$ . The value of Poisson's ratio is :
- (a) 0.15 (b) 0.20  
 (c) 0.25 (d) 0.40

**Ans. (c) :** Young modulus  $E = 200 \text{ GN/m}^2$

Modulus of rigidity  $(G) = 80 \text{ GN/m}^2$

$$E = 2G(1 + \mu)$$

$$E = 2G + 2G\mu$$

$$\mu = \frac{E - 2G}{2G} = \frac{200 - 2 \times 80}{2 \times 80}$$

$$= \frac{40}{160} = 0.25$$

6. If the dynamic viscosity of a fluid is  $0.5$  poise and specific gravity is  $0.5$ , then the kinematic viscosity of that fluid in stokes is :
- (a) 0.25 (b) 0.5  
 (c) 0.75 (d) 1.0

**Ans : (c)**  $\mu = 0.5$  poise

$$\mu = 0.5 \times 10^{-1} \frac{\text{NS}}{\text{m}^2}$$

specific gravity = 0.5

$$\text{specific gravity} = \frac{\rho_l}{\rho_w}$$

$$\rho_l = 0.5 \times 1000 = 500 \text{ kg/m}^3$$

$$\text{kinematic viscosity, } \nu = \frac{\mu}{\rho}$$

$$v = \frac{0.5 \times 10^{-1}}{500}$$

$$v = 1 \times 10^{-4} \frac{\text{m}^2}{\text{s}} \text{ or } 1 \text{ stokes}$$

7. **Centre of buoyancy always :**
- Coincide with the Centre of Gravity
  - Coincide with the centroid of the volume of liquid displaced
  - Remains above the Centre of Gravity
  - Remains below the Centre of Gravity

**Ans. (b) :** Centre of Buoyancy is centroid of the volume of liquid displaced.

Centre of gravity is the point where total mass of the body is assumed to act.

(It is Geometrical centre for body having uniform mass distribution)

**Note**—Centre of buoyancy coincides with centre of gravity in case when body of uniform mass distribution is completely immersed in liquid.

8. **A rectangular block 2 meters long, 1 meter wide and 1 meter deep floats in water, the depth of immersion being 0.5 meter. If the water weighs 10 kN/M<sup>3</sup>, then the weight of the block is :**

- 5 kN
- 10 kN
- 15 kN
- 20 kN

**Ans. (b) :** Given data,

$$L = 2 \text{ m}$$

$$B = 1 \text{ m}$$

$$D = 1 \text{ m}$$

$$\text{Depth of immersion (h)} = 0.5 \text{ m}$$

$$\text{Weight density of water} = 10 \text{ kN/m}^3$$

We know that,

Weight of water displaced = weight of block

$$\gamma_w (0.5 \times 2 \times 1) = \rho_b (2 \times 1 \times 1)$$

$$\rho_b = \frac{10 \times 1 \times 1}{2} = 5 \text{ kN/m}^3$$

$$\begin{aligned} \text{Hence weight of block (w}_b\text{)} &= \rho_b \times V_b \\ &= 5 \times 2 \times 1 \times 1 \\ &= 10 \text{ kN/m}^3 \end{aligned}$$

9. **The distance from pipe boundary, at which the 'turbulent shear stress' is one-third the 'wall shear stress', is :**

- 1/3 r
- 1/2 r
- 2/3 r
- 3/4 r

**Where r is radius of the pipe.**

**Ans. (c) :** The distance from pipe boundary at which the turbulent shear stress is one-third the wall shear stress is

$$\tau = \tau_0 \left( 1 - \frac{y}{R} \right)$$

$$\tau = \frac{\tau_0}{3}$$

$$\frac{\tau_0}{3} = \tau_0 \left( 1 - \frac{y}{R} \right)$$

$$y = \frac{2}{3} R$$

10. **In series-pipe problems :**

- The head loss is same through
- The discharge is same through each pipe
- A trial solution is not necessary
- The discharge through each pipe is added to obtain discharge

**Ans. (b) :** For pipes in series discharge through all pipes will be same. For pipe joined in parallel, the head loss due to friction will be same for pipes.

11. **The best hydraulic channel cross section is the one which has a :**

- Minimum roughness co-efficient
- Least cost
- Maximum area for a given flow
- Minimum wetted perimeter

**Ans. (d) :** Most economical or most efficient or best section of the channel.

• Discharge is maximum when hydraulic radius (R) is maximum and wetted perimeter is minimum ( $\rho_w$ ).

$$\text{Hydraulic radius 'R'} = \frac{A}{\rho_w}$$

12. **For maximum discharge in a circular channel section, the ratio of depth of flow to that of the diameter of the channel is :**

- 0.95
- 0.81
- 0.50
- 0.30

**Ans. (a) :** Most economical circular channel section.

• For maximum discharge through a circular channel, the depth of flow is equal too 0.95 time its diameter.

• Maximum velocity occurs when the depth of flow is 0.81 time the diameter of the circular channel.

13. **If the conjugate depths before and after the jump are 0.5 m and 2.5 m respectively, then the loss of energy in the hydraulic jump will be :**

- 0.8 m
- 1.6 m
- 3.2 m
- 6.4 m

**Ans. (b) :** The energy less due to hydraulic jump is given s.

$$E = \frac{(y_2 - y_1)^3}{4y_1 y_2} = \frac{(2.5 - 0.5)^3}{2 \times 2.5 \times 0.5} = \frac{8}{5} = 1.6 \text{ m}$$

14. **Hydraulic pressure on a dam depends upon its:**

- Length
- Depth
- Shape
- SHape and depth

**Ans. (b) :** Hydraulic pressure on a dam depends upon its depth

$$P = wH \quad (w = \rho g)$$

• The horizontal water pressure acts at a height of H/3.