



JKSSB JE

Civil Engineering

Mini Mock Challenge
(May 8th - May 9th 2021)

Questions &
Solutions

1. The branch of surveying where the curvature of the earth is considered is
- A. Geodetic surveying
 - B. Plane surveying
 - C. Chain surveying
 - D. Reconnaissance surveying

Ans. A

Sol. Geodetic surveying is the branch of surveying which considers the true curvature of the earth. This type of surveying is carried out over a large extend of areas and is considered as more accurate than plane surveying where the curvature of earth is not considered.

2. If an area of 16 km² is represented as 1 cm² on a map, then the Representative fr action (RF) of the map is
- A. 1:1600000
 - B. 1:16000
 - C. 1:400000
 - D. 1:4000

Ans. C

Sol. Given 1cm² on map = 16 km² on ground

$$1\text{cm} \rightarrow 4\text{km} = 400000\text{cm}$$

$$\text{Representative fraction, RF} = 1/400000 = 1:400000$$

3. A map drawn to a scale of 1 in 400 was shrunk by 20%. Calculate the revised RF for the map.
- A. 1 in 400
 - B. 1 in 40
 - C. 1 in 200
 - D. 1 in 500

Ans. D

Sol. The map is shrunk by 20%. Therefore the Shrinkage Ratio(SR) = 0.8

$$\text{Original RF} = 1/400$$

$$\text{Shrunk RF} = \text{Original RF} \times \text{SR}$$

$$\text{Shrunk RF} = \frac{1}{400} \times 0.8 = \frac{1}{500}$$

4. During a chain survey the leader was having 6 arrows left with him. The number of chain lengths completed is:
- A. 6
 - B. 4
 - C. 10
 - D. None of the above

Ans. B

Sol. The number of arrows in the hands of the follower represents number of chain lengths completed. As per Indian standards 10 arrows are to be taken by the leader initially. Here the leader has 6 arrows left with him.

$$\text{The number of chain lengths completed} = 10 - 6 = 4$$

5. If L is the length of the line measured, then Cumulative errors in chain surveying are proportional to

- A. L
- B. \sqrt{L}
- C. $1/L$
- D. L^2

Ans. A

Sol. Cumulative or systematic errors tends to accumulate in only one direction (i.e., +ve or -ve.), while compensating errors tends to go in both directions (i.e., +ve and -ve.)

Cumulative errors are proportional to L and compensating errors are proportional to \sqrt{L} .

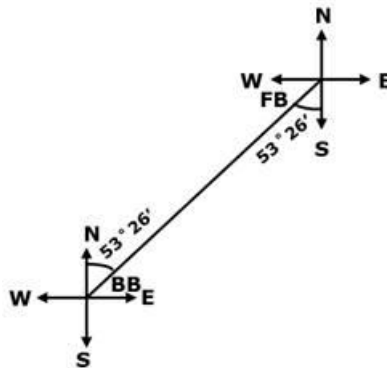
6. The fore bearing of a line is $S\ 53^\circ 26' W$. If there is no local attraction, the back bearing of this line will be:

- A. $S\ 36^\circ 34' W$
- B. $S\ 53^\circ 26' E$
- C. $N\ 36^\circ 34' W$
- D. $N\ 53^\circ 26' E$

Ans. D

Sol. Fore bearing = $S\ 53^\circ 26' W$

Back bearing = $N\ 53^\circ 26' E$



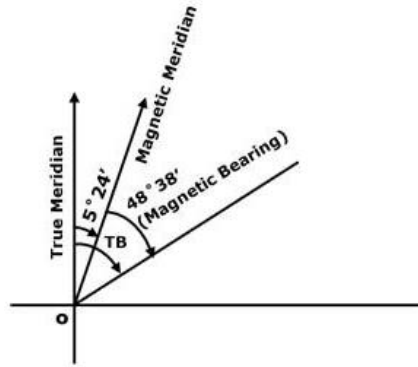
If the bearing is in quadrantal or reduced bearing system, in order to convert the fore bearing to back bearing it is only necessary to change the cardinal points by substituting N for S and E for W and vice versa. The numerical value of the bearing will remain the same.

7. The magnetic bearing of a line is $48^\circ 38'$ and magnetic declination is $5^\circ 24'$ east, then the true bearing is:

- A. $43^\circ 14'$
- B. $54^\circ 02'$
- C. $48^\circ 38'$
- D. $41^\circ 22'$

Ans. B

Sol.



True bearing = Magnetic bearing \pm Declination

Declination is towards East.'

True bearing = $48^{\circ}38' + 5^{\circ}24' = 54^{\circ}02'$.

8. Line joining points of same or equal declination is called:

- A. Agonic line
- B. Aclinic line
- C. Isogonic line
- D. Isoclinic line

Ans. C

Sol. Isogonic lines are the lines that join points of same or equal declination. Agonic lines are lines joining points of zero declination.

Isoclinic lines are line joining points of same or equal dip angle. Aclinic lines are lines joining points of zero dip angle.

9. The size of a theodolite is denoted by

- A. the diameter of the upper plate
- B. the diameter of the lower plate
- C. the diameter of the vertical circle
- D. least count of the instrument.

Ans. B

Sol. The size of a theodolite is denoted by the diameter of the scale plate or lower plate.

For example, an 80mm theodolite will have its diameter of lower plate as 80 mm.

10. Turning of the theodolite telescope in the horizontal plane by 180° about the vertical axis is known as

- A. setting
- B. centering
- C. transiting
- D. swinging

Ans. D

Sol. Swinging is the process of turning the telescope in the horizontal plane. If the telescope is rotated clock wise direction, it is known as right swing. If the telescope is rotated in the anti-clockwise direction, it is known as left swing.

11. When a member is subjected to axial tensile load, the maximum shear stress is equal to

- A. Half the normal stress
- B. Normal stress
- C. Twice the normal stress
- D. Thrice the normal stress

Ans. A

Normal stress

Sol. maximum shear stress = $\frac{\tau}{2}$

12. In case an element is subjected to pure shear, the mohr circle that forms is

- A. a point circle with zero radius and lies on positive x axis
- B. a circle with radius τ and center passes through the origin
- C. a circle with radius τ and center lies on the positive x-axis
- D. a point circle with zero radius and lies on negative x axis

Ans. B

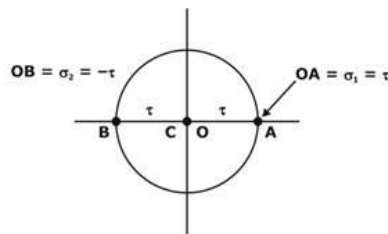
Sol. In case of pure shear,

$$\sigma_x = 0, \sigma_y = 0, \tau_{xy} = \tau$$

$$\sigma_1 = \frac{\sigma_x + \sigma_y}{2} + \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2} = \tau$$

$$\sigma_2 = \frac{\sigma_x + \sigma_y}{2} - \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2} = -\tau$$

$$\tau_{max} = \tau$$



13. A point in a piece of stressed material are $\sigma_x = 400 \text{ N/mm}^2$, $\sigma_y = -100 \text{ N/mm}^2$, and $\tau_{xy} = 0$.

The value of principle stresses in N/mm^2 are

- A. 400 , -100
- B. -400 , 100
- C. -400 , -100
- D. 400 , 100

Ans. A

$$\text{Sol. } \sigma_{max/min} = \frac{\sigma_x + \sigma_y}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau^2}$$

$$\sigma_{max/min} = 150 \pm 250$$

$$\sigma_{max/min} = 400 , -100$$

14. In case of biaxial state of stress, the diameter of Mohr's circle is:

- A. difference of the two principal stresses
- B. sum of the two principal stresses
- C. half the difference of the two principal stresses
- D. half the sum of two principal stresses

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Ans. C

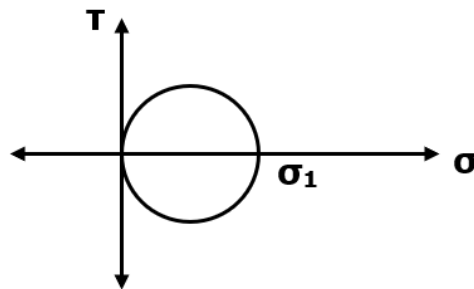
Sol. Radius of a mohr circle = $\tau_{max} = \frac{\sigma_1 - \sigma_2}{2}$

15. Consider the following statement for normal stress

- A. When the structural member is subjected to uniaxial loading, shear stress is zero on a plane where the normal stress in Minimum
- B. When the structural member is subjected to uniaxial loading, shear stress is zero on a plane where the normal stress in Maximum
- C. When the structural member is subjected to uniaxial loading, shear stress is zero on a plane where the normal stress in zero
- D. None of the above

Ans. B

Sol. When the structural member is subjected to uniaxial loading, shear stress is zero on a plane where the normal stress in Maximum



16. Mohr's stress circle helps in determining which of the following

- A. Normal stress on one plane
- B. Normal stress in two plane
- C. Principle stress on 3D plain
- D. Tangential stress on one plane

Ans. B

Sol. Mohr's stress circle helps in determining Normal and Tangential stress in two plane

17. Internal fluid pressure P acts on a thin cylindrical steel pressure vessel of diameter 50mm and a wall thickness of 0.4cm. The ultimate strength of the steel is 3500 kg/cm². Determine the bursting pressure.

- A. 1120 kg/cm²
- B. 560 kg/cm²
- C. 56 kg/cm²
- D. 112 kg/cm²

Ans. B

Sol. Hoop stress in a thin cylinder,

$$\sigma_h = \frac{Pd}{2t}$$

$$3500 = \frac{P \times 50}{2 \times 4}$$

Bursting pressure, P = 560 kg/cm²

21. The elements of flexibility matrix of a structure
- A. are dependent on the choice of co-ordinates
 - B. are independent on the choice of co-ordinates
 - C. both (a) &(b)
 - D. None of these

Ans. A

Sol. The elements of flexibility matrix represent either translation or rotation. So, elements are not necessarily dimensionally homogeneous. For different released structures, different flexibility matrices are formed.

22. To generate the j^{th} column of the flexibility matrix
- A. A unit force is applied at co-ordinate j and the displacements are calculated at all coordinates
 - B. A unit displacement is applied at co-ordinate j and the forces are calculated at all coordinates
 - C. A unit force is applied at co-ordinate j and the forces are calculated at all coordinates
 - D. A unit displacement is applied at co-ordinate j and the displacements are calculated at all coordinates

Ans. A

Sol. Flexibility Matrix: A unit force or moment is applied at a co-ordinate and the displacement (deflection and rotation) are calculated at all co-ordinates

Note:

Stiffness matrix: A unit displacement is applied at co-ordinate j and the forces are calculated at all coordinates

23. Independent displacement components at each joint of a rigid jointed plane frame are
- A. Three linear movements
 - B. Two linear movement and one rotation
 - C. One linear movement and two rotations
 - D. Three rotations

Ans. B

Sol.

Type of joint	Displacement co-ordinates
Plane rigid joint	$\Delta x, \Delta y, \theta_{xy}$
Space rigid joint	$\Delta x, \Delta y, \Delta z$ $\theta_{xy}, \theta_{xz}, \theta_{yz}$
Plane pin joint	$\Delta x, \Delta y$
Space pin joint	$\Delta x, \Delta y, \Delta z$

Δ = Linear displacement

θ = Rotation

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24. The cross-stiffness coefficients in elastic structural analysis are
- A. Always symmetrical
 - B. Symmetrical only in prismatic members
 - C. Symmetrical in symmetrical members only
 - D. None of the above

Ans. A

Sol. According to Maxwell's law of reciprocal theorem stiffness coefficients in elastic structural analysis is always symmetrical.

25. The number of unknown to be determined in the flexibility method will be
- A. The static indeterminacy
 - B. The kinematic indeterminacy
 - C. Sum of static indeterminacy and kinematic indeterminacy
 - D. None of the above

Ans. A

Sol. Flexibility method is based on degree of static indeterminacy
Stiffness method is based on degree of kinematic indeterminacy

26. A post tensioned concrete beam of size 150 mm x 300 mm is prestressed by three cables each with a cross sectional area of 40 mm². An initial stress of 1300 MPa is applied. The loss of stress due to elastic shortening in the beam when simultaneous tensioning and anchoring of all three cables are done will be:
- A. 21 MPa
 - B. 31 MPa
 - C. 41 MPa
 - D. None of the above

Ans. D

Sol. During post-tensioning, if all the cables are tensioned and anchored simultaneously the loss of stress due to elastic deformation of concrete is Zero.

27. On increasing the percentage area of tensile steel in RCC flexural member,
- A. the depth of neutral axis increases.
 - B. the depth of neutral axis remains same.
 - C. the depth of neutral axis decreases.
 - D. the lever arm distance increases.

Ans. A

Sol. The depth of neutral axis is determined by equating the compressive force to tensile force.

$$0.36 f_{ck} b x_u = 0.87 f_y A_{st}$$

$$x_u \propto A_{st}$$

So as the area of tensile steel increases the neutral axis depth increases.

28. Lap length in tension shall not be less than
- A. 15 ϕ
 - B. 24 ϕ
 - C. 30 ϕ
 - D. 36 ϕ

Ans. C

Sol. Length of lap for reinforcement bar in tension shall not be less than development length or 30ϕ whichever is greater

Note: Length of lap for reinforcement bar in compression shall not be less than development length or 24ϕ whichever is greater

29. For M20 grade concrete, design bond stress in limit state method for deformed bars in compression is
- A. 2.4 N/mm^2
 - B. 2.8 N/mm^2
 - C. 3.4 N/mm^2
 - D. 4.4 N/mm^2

Ans. A

Sol. Design bond stress in limit state method for plain bars in tension shall be as below

Grade of concrete	M20	M25	M30	M35	M40 and above
Design bond stress $\tau_{bd} \text{ N/mm}^2$	1.2	1.4	1.5	1.7	1.9

For deformed bars conforming to IS:1786 these values shall be increased by 60 percent. For bars in compression the values of bond stress for bars in tension shall be increased by 25 percent

\therefore For M20 grade concrete, Design bond stress for plain bars in tension = 1.2

Design bond stress for deformed bars in tension = 1.2×1.6

Design bond stress for deformed bars in compression = $1.2 \times 1.6 \times 1.25$
= 2.4 N/mm^2

30. The minimum eccentricity for design of column as per IS: 456-2000 is

- A. $\frac{l}{300} + \frac{D}{50}$
- B. $\frac{l}{30} + \frac{D}{500}$
- C. $\frac{l}{50} + \frac{D}{300}$
- D. $\frac{l}{500} + \frac{D}{30}$

Ans. D

Sol. Minimum Eccentricity: All columns shall be designed for minimum eccentricity, equal to the

$\frac{\text{unsupported length of column}}{300} + \frac{\text{lateral dimension}}{50}$ Subjected to a minimum of 20mm. Where

bi-axial bending is considered, it is sufficient to ensure that eccentricity exceeds the minimum about one axis at a time.

31. The effective width of a column strip of a flat slab is
- A. Half the width of the panel
 - B. Twice the width of panel
 - C. Diameter of column
 - D. Thrice the width of panel

Ans. A

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Sol. As per IS: 456-2000,

Column strip: Column strip means a design strip having a width of $0.25l_2$, but not greater than $0.25l_2$ each side of the column centre line

Where l_1 = span in the direction moments are being determined, measured centre to centre of supports

l_2 = span transverse to l_1 measured centre to centre of supports.

So, $0.25 l_2$ on each side will make total width of strip as half the width of panel.

32. For slabs spanning in two directions for calculating the span to effective depth ratio

- A. Shorter span should be considered
- B. Longer span should be considered
- C. Average of Shorter span and Longer span should be considered
- D. Sum of Shorter span and Longer span should be considered

Ans. A

Sol. For slabs spanning in two directions, the shorter of the two spans should be used for calculating the span to effective depth ratios

For two-way slabs of shorter spans (up to 3m) with mild steel reinforcement, the span to overall depth ratios given below may generally be assumed to satisfy vertical deflection limits for loading class up to 3 kN/m^2

Simply supported slab 35

Continuous slabs 40

For high strength deformed bars of grade Fe415, the values given above should be multiplied by 0.8

33. Spacing of stirrups in rectangular beam

- A. Increased at ends
- B. Increased towards the center of beam
- C. Decreased towards the center of beam
- D. Kept constant throughout the length

Ans. B

Sol. As shear force reduces at the center of the rectangular beam, spacing of stirrups in a rectangular beam is increased at the center of the beam.

34. Maximum Shear Stress, (in N/mm^2) of M20 grade concrete is

- A. 2.5
- B. 2.8
- C. 3.1
- D. 4

Ans. B

Sol. As per IS: 456-2000 Maximum Shear Stress (in N/mm^2) of various grade of concrete is given below

Concrete Grade	M15	M20	M25	M30	M35	M40
$\tau_{c max}$ N/mm^2	2.5	2.8	3.1	3.5	3.7	4.0

35. For a cantilever beam to ensure lateral stability, the clear distance from the free end of the cantilever to the lateral restraint shall not exceed

- A. $25 b$ or $100b^2/d$ whichever is less
- B. $25 b$ or $100b^2/d$ whichever is more
- C. $60 b$ or $250b^2/d$ whichever is less
- D. $60 b$ or $250b^2/d$ whichever is more

Ans. A

Sol. As per IS: 456-2000 Slenderness Limit for Beams to Ensure Lateral Stability

- For a cantilever, the clear distance from the free end of the cantilever to the lateral restraint shall not exceed $25 b$ or $100b^2/d$ whichever is less
 - A simply supported or continuous beam shall be so proportioned that the clear distance between the lateral restraints does not exceed $60 b$ or $250b^2/d$ whichever is less
- Where d is the effective depth of the beam and b the breadth of the compression face midway between the lateral restraints

36. In tensile strength test of concrete, if the maximum nominal size of aggregate is more than 20 mm, the size of concrete specimen used is

- A. 15 cm x15 cm x70 cm
- B. 15 cm x15 cm x15 cm
- C. 10 cm x10 cm x50 cm
- D. 10 cm x10 cm x70 cm

Ans. A

Sol. Tensile strength of the concrete is tested indirectly, by noting its modulus of rupture that is determined by preparing a block of

- Size 15 cmx15cmx70 cm if the maximum nominal size of aggregate is greater than 20 mm.
- Size 10cm x10cm x50cm if the maximum nominal size of aggregate is less than 20 mm.

37. Poisson's ratio of concrete

- A. Remains constant
- B. Increases with richer mixes
- C. Decreases with richer mixes
- D. None of the above

Ans. B

Sol. Poisson's ratio of concrete Increases with richer mixes

Richer concrete mixes have more cement content.

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38. A doubly reinforced beam is recommended when
- A. The depth of the beam is restricted
 - B. The breadth of the beam is restricted
 - C. The depth and breadth of the beam is restricted
 - D. None of the above

Ans. C

- Sol. A doubly reinforced beam is recommended when
- The depth and breadth of the beam is restricted
 - Strength available from singly reinforced beam is inadequate

39. Shrinkage In concrete slab causes
- A. Shear cracks
 - B. Tension cracks
 - C. Compression cracks
 - D. None of the above

Ans. B

Sol. Cracks are developed when tensile stresses and strain are produced during shrinkage due to restraint. Thus, shrinkage causes tension cracks.

40. In a reinforced concrete T beam, the position of neutral axis will
- A. Be within the flange
 - B. Be within the web
 - C. Depends percentage of reinforcement
 - D. At the junction of web and flange

Ans. C

Sol. The neutral axis of T beam may be within the flange or web depending on percentage of reinforcement, thickness of flange, proportion of cross section and compressive strength of material.

41. A fill have volume of 1500m^3 is to be constructed at a void ratio of 0.6. The borrow pit soil has void ratio of 1.2. The volume of soil required to be excavated from the borrow pit will be
- A. 10
 - B. 27
 - C. 30
 - D. 40

Ans. B

Sol. **For void ratio 1.2**

$$e = \frac{V_{v1}}{V_s} \text{ (Volume Of solid remains constant)}$$

$$V_{v1} = V_s \times 1.2$$

$$\text{Total volume} = 2.2V_s$$

For void ratio 0.6

$$e = \frac{V_{v2}}{V_s}$$

$$V_{v2} = V_s \times 0.6$$

Total volume = $1.6V_s$

Change in volume = $\frac{2.2-1.6}{2.2} = 27\%$

42. Density index of medium dense sand is

- A. 20
- B. 30
- C. 50
- D. 80

Ans. C

Sol. Density index is given below

- * 0-15 : very loose
- * 15-35 : loose
- * 35-65 : medium dense
- * 65-85 : dense
- * 85-100 : very dense

43. Stokes law is valid for _____ flow, when particle size is between _____.

- A. Transition, 0.2mm - 0.0002 mm
- B. Laminar, 0.2mm - 2mm
- C. Transitional, 0.2mm - 0.0002 mm
- D. Laminar, 0.2mm - 0.0002mm

Ans. D

Sol. Stokes law is valid for **Laminar flow** when particle size is between **0.2mm - 0.0002mm**.

44. Which of the following statement is correct for the marine deposit soil?

- A. They have high shear strength and high compression
- B. They have high shear strength and high compression
- C. They have low shear strength and low compression
- D. They have low shear strength and high compression

Ans. D

Sol. Marine deposit soil have low shear strength and high compression.

45. Plasticity index of the clay is

- A. 0
- B. 10
- C. 12
- D. 20

Ans. D

Sol. * Sand 0

- * Silt 10-15
- * Clay 15-100

46. Specific gravity of organic soil is

- A. 1.1
- B. 1.8
- C. 2.2
- D. 2.4

Ans. B

50. The grain size of the medium grained sand lies between
- A. 4.75mm - 2 mm
 - B. 2mm - 0.425 mm
 - C. 0.425mm - 75 μ
 - D. 75 μ - 2 μ

Ans. B

- Sol. * 4.75mm - 2 mm - coarse sand
* 2mm - 0.425 mm - medium sand
* 0.425mm - 75 μ - fine sand
* 75 μ - 2 μ - silt

51. Gauge pressure is zero at location where
- A. HGL intersect Fluid
 - B. HGL intersect TGL
 - C. TGL intersect fluid
 - D. All of the above

Ans. A

Sol. Gauge pressure is zero at location where HGL intersect fluid.

52. In open channel flow, _____ is used to define the Froude's number.
- A. Depth of flow
 - B. Hydraulic radius
 - C. Wetted parameter
 - D. Area/ Top width

Ans. D

Sol. Froude's number = $\frac{V}{\sqrt{gD}}$

Where:

V = Water velocity

D = Hydraulic depth (cross sectional area of flow / top width)

g = Gravity

When:

Fr = 1, then flow is critical flow,

Fr > 1 then flow is supercritical flow

Fr < 1, then flow is subcritical flow

53. In OCF, max velocity occurs just below the free surface due to
- A. Viscosity
 - B. Turbulence
 - C. Resistance of air at the surface
 - D. All of the above

Ans. C

Sol. In OCF, max velocity occurs just below the free surface due to Resistance of air at the surface.

54. For sub critical flow, the depth of flow is
- A. Equal to critical depth
 - B. Greater than critical depth
 - C. Less than critical depth
 - D. Not equal than critical depth

Ans. B

Sol. Froude's number = $\frac{V}{\sqrt{gD}}$

Where:

V = Water velocity

D = Hydraulic depth (cross sectional area of flow / top width)

g = Gravity

When:

Fr = 1, then flow is critical flow,

Fr > 1 then flow is supercritical flow

Fr < 1, then flow is subcritical flow

Hence For sub critical flow, the depth of flow is greater than critical depth and the velocity of flow is less than critical velocity.

55. Which of the following is example of Gradually varying unsteady flow

- A. Back water curve due to any obstruction
- B. Flood flow in a river
- C. Hydraulic jump
- D. Surges

Ans. B

Sol. • Back water curve due to any obstruction - Gradually varying steady flow

- Flood flow in a river - Gradually varying unsteady flow
- Hydraulic jump - Rapidly varying steady flow
- Surges - Rapidly varying unsteady flow

56. The air vessel on the suction and delivery side of the pump is used to

- A. Reduce the friction loss
- B. Reduce the accelerating head
- C. Reduce the work done
- D. All of the above

Ans. D

Sol. The air vessel on the suction and delivery side of the pump is used to

- Reduce the friction loss
- Reduce the accelerating head
- Reduce the work done

57. Which of the following statement is correct for pump's?

- A. Chance of cavitation is more in inlet
- B. Chance of cavitation is more on outlet
- C. Cavitation in the pump is due to NPSH
- D. (A. and (c)

Ans. D

Sol. In case of pump

- Chance of cavitation is more in inlet
- Cavitation in the pump is due to NPSH

58. Run way speed of the Francis turbine is

- A. 1.5 times of the normal speed
- B. 1.8 times of the normal speed
- C. 2-2.2 times of the normal speed
- D. 2.5-3 times of the normal speed

Ans. B

Sol. • Run way speed of the Pelton wheel turbine = 1.5 times of the normal speed

- Run way speed of the Francis turbine = 1.8 times of the normal speed
- Run way speed of the Kaplan turbine = 2-2.2 times of the normal speed

59. Archimedes screw type pumps are used in

- A. Water treatment plant
- B. Water distribution system
- C. Sewage treatment plant
- D. Irrigation

Ans. C

Sol. Archimedes screw type pumps are used in sewage treatment plant

60. Given that the vapor pressure head(max) = 1m. Failure head= 40m. Atmospheric pressure =9m and height at which turbine is set above the tail race heel = 2m. Find cavitation coefficient

- A. 0.1
- B. 0.12
- C. 0.14
- D. 0.15

Ans. D

Sol. the vapor pressure head(max) = 1m = H_v

Failure head= 40m = H

Atmospheric pressure=9m = H_a

height at which turbine is set above the tail race heel = 2m = H_s

$$\sigma = \frac{H_a - H_v - H_s}{H}$$

$$= \frac{9 - 1 - 2}{40}$$

$$= 0.15$$

61. The ratio of density of liquid to density of pure water at standard temperature is called

- A. Compressibility of liquid
- B. Surface tension
- C. Density of liquid
- D. Specific gravity of liquid

Ans. D

Sol. The ratio of density of liquid to density of pure water at standard temperature is called Specific gravity of liquid

62. Bulk modulus of an ideal fluid is
- A. Infinite
 - B. Zone
 - C. $2 \times 10^5 \text{N/mm}^2$
 - D. $0.7 \times 10^5 \text{N/mm}^2$

Ans. A

Sol. Bulk modulus = $\frac{1}{\text{compressibility}}$

Compressibility of ideal fluid = 0, so, bulk modulus is infinite.

63. The elastic tendency of a fluid surface which makes it acquire the least area possible is called
- A. Cohesion
 - B. Viscosity
 - C. Surface tension
 - D. Adhesion

Ans. C

Sol. The elastic tendency of a fluid surface which makes it acquire the least source area possible is called Surface tension

64. Mercury is used in monometer because
- A. It has high density
 - B. It has low vapor pressure. so, it does not evaporate easily
 - C. Its freezing point is much lower than that of water
 - D. All of the above

Ans. D

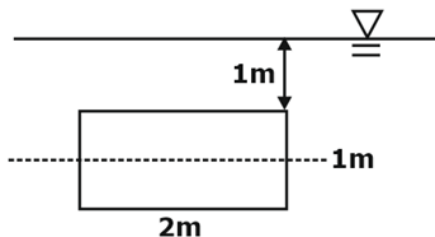
Sol. Mercury is used in monometer because

- It has high density
- It has high vapor pressure. so, it does not evaporate easily
- Its freezing point is much than then that of water

65. A rectangular plate 1m x 2m is immersed in a water and its top 1m surface being .5m below the water level. The depth of pressure from top surface is
- A. 1.3m
 - B. 1.5m
 - C. 1.72m
 - D. 2m

Ans. C

Sol.



$$h_c = y + \frac{I_{xx}}{yA}$$

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$$= 1.5 + \frac{1 \times 2^3}{1.5 \times 1 \times 2}$$
$$= 1.722 \text{ m}$$

66. When an oven dried sample of soil is kept open in the atmosphere, it absorbs some amount of water. This water is known as

- A. Capillary water
- B. Gravity water
- C. Hygroscopic water
- D. Available water

Ans. C

Sol. When an oven dried sample of soil is kept open in the atmosphere, it absorbs some amount of water. This water is known as hygroscopic water. Hygroscopic water cannot be extracted or absorbed by the root plants. So, at this stage, growth of plants is stopped and ultimately the plants are dead.

67. The moisture content of the soil, after free drainage has removed most of the gravity water is known as

- A. Permanent wilting point
- B. Available moisture
- C. Field capacity
- D. Saturation capacity

Ans. C

Sol. The moisture content of the soil, after free drainage has removed most of the gravity water is known as Field capacity. Field capacity of soil depends upon capillary tension in soil and porosity of soil.

68. The duty of a crop is 216 hectares per cumecs, when the base period of crop is 50 days. Find the delta for the crop

- A. 1m
- B. 2m
- C. 4m
- D. 2.16 m

Ans. B

Sol. Delta for the crop in meter, $\Delta = \frac{8.64 B}{D}$

B= Base period in days

D= Duty of water in hectares per cumecs

$$\therefore \Delta = \frac{8.64 \times 50}{216} = 2\text{m}$$

69. Method of applying water directly to the root zone of the plant is called

- A. Check flooding
- B. Furrow irrigation
- C. Drip irrigation
- D. Sprinkler irrigation

Ans. C

Sol. Drip irrigation is the latest method of irrigation. In this method water and fertilizer is supplied slowly and directly to the rootzone of the plants in order to minimize the losses due to evaporation and percolation.

Note:

Different methods of irrigation

- * free flooding
- * Border flooding
- * Check flooding
- * Basin flooding
- * Furrow method
- * Sprinkler method

70. Water shed canal is also known as

- A. Side slope canal
- B. Contour canal
- C. Ridge canal
- D. All the above

Ans. C

Sol. Ridge canal or water shed canal

A canal which is aligned along the water shed line is known as watershed canal. This canal can irrigate the areas on both sides.

Note:

Contour canal

A canal which is aligned parallel to the contours of a country is called contour canal. it can irrigate only on one side of the canal

Side slope canal.

A canal which is aligned perpendicular to the contours of a country is called side slope canal. In side slope canal cross drainage works are completely eliminated.

71. The height of dowel above the road level should not be more than

- A. 10cm
- B. 25cm
- C. 30cm
- D. 40cm

Ans. C

Sol. Dowel or Dowla

The raised portion provided on the canal side of the service road for the safety of vehicles plying on it is known as dowel or dowla. The height of dowel is 30cm and width at top varies from 30 to 60cm

72. Wetted perimeter of a regime Channel for a discharge of 121 cumecs as per Lacey's theory will be

- A. 40.75 m
- B. 52.25 m
- C. 55 m
- D. 50 m

Ans. B

Sol. As per Lacey's theory, Wetted perimeter = $4.75\sqrt{Q}$ Q= Discharge in cumecs

$$=4.75 \times \sqrt{121}$$

$$=52.25 \text{ m}$$

Note:

Design steps of Lacey's theory

I. Calculate Silt factor, $f = 1.76 \sqrt{d}$ d in mm

II. Find out Velocity $V = \left(\frac{Qf^2}{140}\right)^{\frac{1}{6}}$

III. Find out Hydraulic radius $R = \frac{5}{2} \frac{v^2}{f}$

IV. Find out Area $A = \frac{Q}{V}$

V. Find out Perimeter, $P = 4.75 \sqrt{Q}$

VI. Slope, $S = \frac{f^{\frac{5}{3}}}{3340 Q^{\frac{1}{6}}}$

73. Soil becomes, practically infertile if its pH value is

- A. 1
- B. 4
- C. 11
- D. 14

Ans. C

Sol. Soil becomes, practically infertile if its pH value is 11

74. For the repairing of an old but sound concrete lining, the lining preferred is

- A. Concrete lining
- B. Shot crete lining
- C. Brick lining
- D. Asphalt lining

Ans. B

Sol. * Laying of the impervious layer which protects the bed and sides of the canal is called canal lining.

* Shot crete is a mixture of cement and sand in the ratio of 1:4. This lining is preferred for the repairing of an old but sound concrete lining.

75. Lacey assumed the shape of channel carrying incoherent alluvium as

- A. Rectangular
- B. Trapezoidal
- C. Semi elliptical
- D. Parabolic

Ans. C

Sol. According to Lacey theory, there is only one section and only one longitudinal slope at which the Chanel will carry a particular discharge with particular grade. He found that in final regime, the channel cross-section becomes semi elliptical.

76. In connection line from water main to building, goose-neck is provided to
- A. quickly open or stop the flow to building
 - B. avoid stresses and strains on the joint due to temperature variations and vibrations
 - C. detect leakages in pipe line
 - D. to provide additional connections in future

Ans. B

Sol. Goose-neck is a small curved flexible pipe for making connection between ferrule and service pipe. It is made of lead to provide flexibility. It takes care of settlement of service pipe and avoids stresses and strains due to temperature change.

77. Design period for slow sand filters as suggested by CPHEEO is
- A. 50 years
 - B. 30 years
 - C. 25 years
 - D. 10 years

Ans. D

Sol. Design period for slow sand filter is taken as 10 years.

78. The minimum diameter for public sewer in hilly areas where steep slopes are prevalent is
- A. 300
 - B. 150
 - C. 100
 - D. 50

Ans. C

Sol. Minimum diameter for given condition is 100 mm.

79. The design period for clear water conveying mains is
- A. 15 years
 - B. 30 years
 - C. 50 years
 - D. 100 years

Ans. B

Sol. Design period for water conveying mains is taken as 30 years whereas design period for water treatment structures is taken as 15 years.

80. The best system of plumbing of drainage work in building is:
- A. One pipe system
 - B. Two pipe system
 - C. Single stack system
 - D. Partially ventilated single stack system

Ans. B

Sol. The best system of plumbing of drainage work in building is two pipe system, one for inlet and second one for outlet.

81. During sludge digestion:
- A. Acidity condition should prevail
 - B. Alkaline condition should prevail
 - C. Acidity or alkaline condition
 - D. Neutral condition should prevail

Ans. B

Sol. * Lower pH value suppresses methane formation.
* pH decreases due to overdosing of raw sewage, over withdrawal of digested sludge and by sudden admission of industrial waste.
* Remedy is to add hydrated lime.

82. BOD of effluent from secondary biological treatment of sewage is :
- A. 0 to 5% of the original B. 5 to 10% of the original
C. 25 to 40 % of the original D. 50 to 60% of the original

Ans. B

Sol. BOD removal in primary tank is around 20-30% and BOD of effluent from secondary biological treatment is about 5-10% of the original.

83. A method of disinfection of drinking water:
- A. Treatment with excess lime B. Treatment with ozone
C. Electro-Katadyn process D. All the above

Ans. D

Sol. * Addition of lime produces chlorine in water which acts as disinfectant since chlorine is an oxidizing agent.
* Ozone is also used as a disinfectant since it oxidizes with the help of nascent oxygen.
* Electro-Katadyn process is also a disinfection process.

84. Which of the following is incorrect regarding a slow sand filter:
- A. Incoming water should not be treated by coagulants
B. Depth of water should double the depth of filter sand
C. Loss of head is limited to a maximum of 1.2 m
D. Cleaning should not be done by back washing

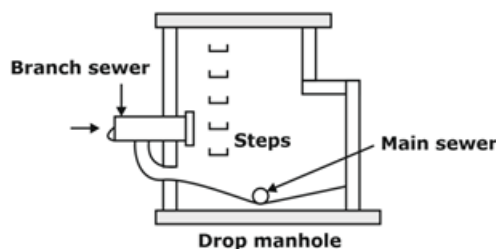
Ans. B

Sol. Depth of sand for slow sand filter is 90-100 cm = 1 m, Depth of water over sand medium would be approximately the same as the depth of sand medium i.e. around 1 m.

85. An appurtenance used to connect high level branch sewer to low level branch sewer is
- A. Manhole B. Drop manhole
C. Inverted siphon D. Catch basin

Ans. B

Sol. A manhole which is constructed to connect the high level branch sewer (>0.6m) to the low level main sewer by vertically dropping pipe is known as drop manhole



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86. A hill road with ruling gradient of 1 in 20 has a horizontal curve of radius 75 m. The compensated gradient on the curve will be:

- A. 1%
- B. 4%
- C. 5%
- D. None of these

Ans. B

Sol. Gradient, $N = 1/20 = 5\%$

$$\text{Grade compensation} = \frac{(30+R)}{R} \text{ or } \frac{75}{R}$$

$$= \frac{30 + 75}{75} = 1.4\%$$

$$= \frac{75}{75} = 1\%$$

Use minimum. I.e., 1%

Compensated gradient = $5\% - 1\% = 4\%$

87. If the longitudinal friction coefficient is 0.35, the resultant retardation for stopping the vehicle on the road is _____ m/s².

- A. 9.8
- B. 5.6
- C. 3.43
- D. 2.7

Ans. C

Sol. Retardation, $a = fg = 0.35 \times 9.81 = 3.43 \text{ m/s}^2$.

88. If the length of the wheel base is made thrice the initial, the mechanical widening on the horizontal curve has to be

- A. doubled
- B. halved
- C. increased by 3 times
- D. increased by 9 times

Ans. D

Sol. Mechanical widening, $W_m = \frac{nl^2}{2R}$

If length (l) is made thrice, the mechanical widening increases by 9 times.

89. Which among the following factors are not considered while designing a valley curve on a highway is:

- A. comfort to passengers
- B. stopping sight distance
- C. aesthetic consideration
- D. drainage

Ans. B

Sol. Criteria for design of valley curve for highways:

- i) vehicle head light distance
- ii) Motorist comfort
- iii) drainage at lowest point of valley
- iv) aesthetic consideration

ISD and SSD are not a problem on valley curves.

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Ans. C

Sol. Allowable tensile strength of concrete = $\sigma_c = 0.9 \text{ MPa} = 90 \text{ kN/m}^2$

Coefficient of friction, $f = 1.5$

Density of concrete, $\gamma_c = 24 \text{ kN/m}^3$

For plain cement concrete road,

$$l_c = \frac{2\sigma_c}{\gamma_c f} = \frac{2 \times 90}{24 \times 1.5} = 5 \text{ m}$$

95. The maximum spacing of expansion joints in rigid pavements l_e is given by:

A. $l_e = \frac{\delta}{2\alpha t}$

B. $l_e = \frac{2\delta}{\alpha t}$

C. $l_e = \frac{\delta}{\alpha t}$

D. $l_e = \frac{\alpha}{2\delta t}$

Ans. A

Sol. The maximum spacing of expansion joint, $l_e = \frac{\delta}{2\alpha t}$

96. The annual average daily traffic in a proposed highway at last count is 300 CVD. The annual rate of growth of traffic is 5%. If the road is to be completed in two years, the initial traffic in the road after construction will be:

A. 300

B. 331

C. 350

D. 360

Ans. B

Sol. $A = P(1+r)^n = 300(1+0.05)^2 = 330.75$. Say 331 CVD

97. Fixed delays in highways is due to

A. pedestrians crossing the road

B. parked vehicles

C. traffic signals

D. road repairs

Ans. C

Sol. Fixed delay is the delay to which a vehicle is subjected regardless of the amount of traffic volume and interference present. Fixed delays occur primarily at intersections due to traffic signals and at level crossings of railways.

98. Find the effective green time of a traffic signal, where lost time due to starting delay is 2 seconds, actual green time is 19 seconds and amber time is 3 seconds.

A. 14 sec

B. 19 sec

C. 20 sec

D. 24 sec

Ans. C

Sol. Effective green time = actual green time + amber time – lost time
= $19 + 3 - 2 = 20 \text{ sec}$.

Ans. B

Sol. Present traffic = $2 \times 5 = 10$ gate positions

Future traffic = present traffic \times growth factor = $10 \times 2 = 20$ numbers

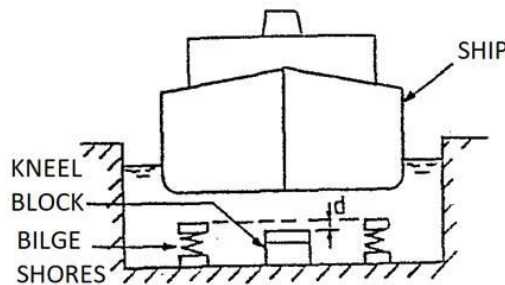
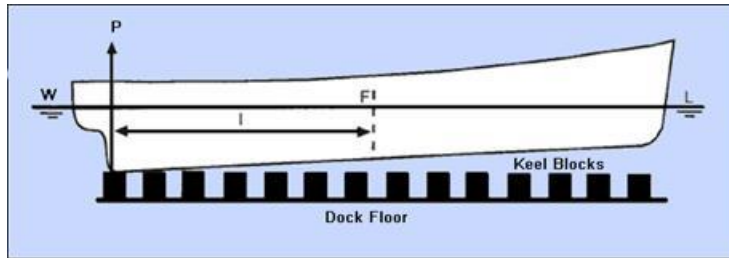
Rounded to higher number = 25 numbers

104. Keel and Bilge blocks are used as:

- A. Impact absorbers of quay walls
- B. Floating indicators
- C. Support for ships in dry docks
- D. Anchorage devices for ships

Ans. C

Sol. Keel and Bilge blocks are used to support the ship in dry docks.



105. Structure constructed in tunneling operations, in advance of main drivage, along its alignment, to gain information about the ground is called:

- A. shaft
- B. tunnel invert
- C. tunnel soffit
- D. pilot tunnel

Ans. D

Sol. A pilot tunnel is a small tunnel or shaft excavated in the center, and in advance of the main drivage, to gain information about the ground and create a free face, thus simplifying the blasting operations.

106. Calculate the cost of the plastering required for a wall of 5 m long, 4 m high and 300 mm thick, if the rate of plastering is Rs. 10 per square meter.

- A. 101
- B. 200
- C. 336
- D. 423

Ans. B

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Sol. Area of the wall = $5 \times 4 = 20 \text{ m}^2$

Rate of plastering per square meter = Rs10/-

Cost of plastering = $20 \times 10 = \text{Rs } 200 \text{ /-}$

107. Preliminary project report for a road project must contain:

- A. the detailed estimate cost based on detailed design
- B. the several alternatives of the project that have been considered
- C. the soil survey, traffic survey, concept design and approximate cost
- D. the contract documents for inviting tenders

Ans. C

Sol. Preliminary project report contains topographic details and soil survey along alternatives alignments, consideration of geometric design and other requirements of alignments, preparation of plans and comparison of alternate routes, economic analysis and selection of final alignment.

108. _____ recognizes that a project or phrase should begin and commits the organization to do so:

- A. Initiating Process
- B. Solicitation Process
- C. Scoping process
- D. Planning process

Ans. A

Sol. Creation of project character is the specific activity that is done in the Initiating process.

109. Unlike bar charts, milestone charts show?

- A. Scheduled chart or completion of major deliverables and key external interfaces
- B. Activity start and end dates of critical tasks
- C. Expected durations of the critical path
- D. Dependencies between complementary projects

Ans. A

Sol. Milestone are singular points in time, such as the start or completion of a significant activity or group of activities.

110. Which of the following is the correct statement for length of the long wall as one move from earthwork to brick work in super structure in long and short wall method?

- A. Its value decreases
- B. Its value depends upon the length of the wall.
- C. Its value increases.
- D. Its value remains same.

Ans. A

Sol. The estimation of building quantities like earth work, foundation concrete, brickwork in plinth and superstructure etc. can be worked out using long wall short wall method.

111. The estimate prepared on the basis of the built-up covered area at the floor level of any storey of a building is known as:

- A. Building cost index estimate
- B. Cubical content method
- C. Unit base method
- D. Plinth area estimate

Ans. D

Sol. Plinth area estimate: The cost of construction is determined by multiplying plinth area with plinth area rate. The area is obtained by multiplying length and breadth (outer dimensions of building). In fixing the plinth area rate, careful observation and necessary enquiries are made in respect of quality and quantity aspect of materials and labour, type of foundation, height of building, roof, wood work, fixtures, number of storey's etc.

112. The duration of an activity $i-j$ is 8 . The (EPO) j is 18 . The EST is 5 . What is the Free float of $i-j$

- A. 5
- B. 13
- C. 10
- D. 8

Ans. A

Sol. Free float – amount of time by which an activity can be delayed without affecting the succeeding activity.

$$F_F = T_E^j - T_E^i - t_{ij} \\ = 18 - 5 - 8 = 5$$

113. If the values of t_o, t_p of an activity are 4 and 15, what is the variance of the activity?

- A. 3.22
- B. 3.36
- C. 3.87
- D. 3.92

Ans. B

Sol. Variance is given as

$$\sigma^2 = \left(\frac{t_p - t_o}{6} \right)^2 \\ = \left(\frac{15 - 4}{6} \right)^2 \\ = \frac{121}{36} = 3.36$$

114. In time estimates PERT follows

- A. Probabilistic approach
- B. Deterministic approach
- C. Possibility approach
- D. Non-Probabilistic approach

Ans. A

Sol. PERT is used for new projects such as research work or inventing a medicine for a disease. These projects have no previous record of time estimate and hence are non deterministic in nature. Hence PERT follows probabilistic approach.

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115. If the values of t_o , t_l , t_p are 8, 12 and 18, the value of t_e is

- A. 12.1
- B. 12.3
- C. 12.6
- D. 13

Ans. B

Sol. T_e is given as

$$t_e = \frac{t_o + 4t_l + t_p}{6}$$
$$= \frac{8 + 4 \times 12 + 18}{6} = 12.3$$

116. Fulkerson's rule stands for

- A. Planning the events
- B. Scheduling the events
- C. Numbering the events
- D. Controlling the events

Ans. C

Sol. Fulkerson's rule is used in numbering the events of a networks chart.

117. PERT stands for

- A. Programme evaluation and research technique
- B. Programme examination and review technique
- C. Programme examination and research technique
- D. Programme evaluation and review technique

Ans. D

Sol. PERT stands for Programme evaluation and review technique.

118. The important events located on the activities in a bar chart are known as

- A. Key events
- B. Key stones
- C. Milestones
- D. Key points

Ans. C

Sol. The important located on the activities in a bar chart are known as milestones.

119. The value of dismantled materials:

- A. Scrap value
- B. Rateable value
- C. Salvage value
- D. Market value

Ans. A

120. The difference between the latest allowable time and the earliest expected time is:





- A. Maximum float
- B. Total float
- C. Slack time
- D. Free float

Ans. C

Sol. Stack time can be defined as the amount of time a task can be delayed without causing another task to be delayed or impacting the completion date of the project.

$$S = T_L - T_E$$

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