DO NOT OPEN THE SEAL OF THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

HARYANA PUBLIC SERVICE COMMISSION

Assitantant Engineer

Time Allowed : 2:00 Hours | Maximum Marks : 100

IRRIGATION DEPT. (7.10.2017)

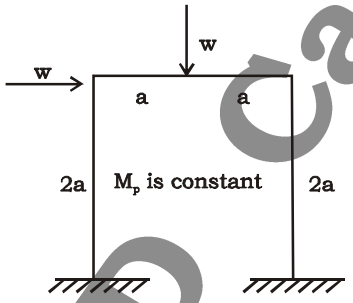
1. In 500 gm sample of coarse aggregate there are 100 gm flaky particles 80 gm elongated particles. What are the flakiness and elongation indices (total) as per IS?
(A) 40% (B) 36%
(C) 18% (D) 4%

2. The sequent depth ratio of a hydraulic jump in a rectangular channel is- 16.48. What is the Froude number (approx) at the beginning of the jump ?
(A) 9.0 (B) 12.0
(C) 5.0 (D) 8.0

3. What is the quantity of cement (in kg) and of dry sand (in cubic meter) respectively required for preparing 1 cubic meter of wet cement mortar of 1 : 5 proportion ?
(A) 270 and 1.00 (B) 290 and 1.04
(C) 290 and 1.00 (D) 310 and 1.04

4. The maximum bending moment caused by a hydrostatic - type load acting over a segment 'a' from the fixed end, with zero intensity at support on a cantilever beam is:
(A) $\frac{-Wa}{2}$ (B) $\frac{-Wa(L+a)}{2}$
(C) $\frac{-Wa}{3}$ (D) $\frac{-2Wa}{3}$
where 'W' is the total load on the beam

5. What is the ultimate load for the frame shown in the figure below ?

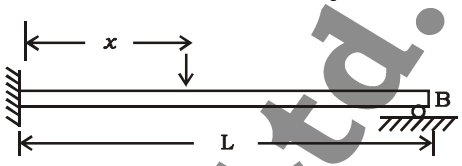


(A) M_p/a (B) $2M_p/a$
(C) $3M_p/a$ (D) $4M_p/a$

6. If the slopes of two sewers A and B of same size are 1 in 100 and 1 in 400 respectively, the ratio of velocity of flow in the two sewers A and B will be :
(A) 0.5 (B) 1
(C) $2^{2/3}$ (D) 2

7. If an infinite slope of clay at a depth 5 m has cohesion of 1 t/m^2 and unit weight 2 t/m^3 the stability number will be
(A) 0.1 (C) 0.3
(C) 0.2 (D) 0.4

8. For the propped cantilever shown in the figure, influence for reaction at the proposed end is given by $y_1 = f(x)$.



The influence line ordinate (y_2) for moment at A is given by the equation.
(A) $y_2 = f(x).L$ (B) $y_2 = f(x).x$
(C) $y_2 = x - f(x).x$ (D) $y_2 = x - f(x).L$

9. The combined correction of curvature and refraction for a distance of 1400 m is :
(A) 0.153 m (B) 0.132 m
(C) 0.094 m (D) 0.021 m

10. In an inclined terrain, if the elevation difference between the two ends of a line is h and the inclined length of the line is L, the correction for slope is :
(A) h^2/L^2 (B) $h^2/2L^2$
(C) $2h^2/L^2$ (D) $h^2/2L$

11. What does the Williot-Mohr diagram yield ?
(A) Forces in members of a Truss
(B) Moments in a fixed beam
(C) Reactions at the supports
(D) Joint displacement of a pin jointed frame

12. A catchment area of 90 hectare has a runoff coefficient of 0.4. A storm of duration larger than the time of concentration of the catchment and of intensity 4.5 cm/hr creates a peak discharge rate of :
(A) 9.0 m^3/s (B) 0.45 m^3/s
(C) 450 m^3/s (D) 4.5 m^3/s

13. The worst condition of uplift on the floor of a siphon aqueduct occurs when there is:
(A) high flood flow in the drainage with canal dry
(B) full supply flow in the canal with drainage dry
(C) high flood flow in the drainage with canal running full
(D) water is at drainage bed and canal is dry

14. Which one of the following equipments is useful in determining spot speed in traffic engineering ?
(A) Enoscope (B) Periscope
(A) Radar (D) Tachometer

15. A clay layer 5 m thick in field takes 300 days to attain 50% consolidation with condition of double drainage. If the same clay layer is underlain by hard rock then the time taken to attain 50% consolidation will be :
(A) 300 days (B) 600 days
(C) 900 days (D) 1200 days

16. As compared to working stress method of design, limit state method takes concrete to :
(A) a higher stress level
(B) a lower stress level
(C) the stress level
(D) sometimes higher but generally lower stress level

17. If 'g_1' and 'g_2' are the two gradients, 'r' is the rate of change of grade (%) per chain, the length of the vertical curve will be :
(a) $\left(\frac{g_1 + g_2}{r^2}\right)$ (b) $\left(\frac{g_1 - g_2}{\sqrt{r}}\right)$
(c) $\left(\frac{g_1 - g_2}{r}\right)$ (d) $\left(\frac{\sqrt{g_1 + g_2}}{r^3}\right)$

18. What treatment is adopted for making timber fire resistant?
(A) ASCU treatment
(B) Abel's process
(D) Creosoting
(D) Tarring

19. If a solid bar of uniform diameter D and length L is hung vertically from a ceiling. If the density of the material of the bar is 'ρ' and the modulus of elasticity is 'E', then the total elongation of the bar due to it's own weight is:
(A) $\rho L/2E$ (B) $\rho L^2/2E$
(C) $\rho E/2L$ (D) $\rho E/2L^2$

20. Eutrophication of takes primarily caused due to
(A) multiplication of bactlria
(B) excessive inflow of nutrients
(C) increase of benthic organisms
(D) thermal and density currents

21. A serious limitation of interdependencies between various activities is generally observed in:
(A) bar charts
(B) Milestone charts
(C) Net work analysis
(D) Job layouts

22. A statically determinate structure.
(A) Can not be analyzed without the correct knowledge of modulus of easticity
(B) Must necessarily have roller support at one of its ends.
(C) Requires only statical equilibrium equations for its analysis.
(D) Will have zero deflection at its ends.

23. A 20 m chain was found to be 10 cm too long after chaining a distance of 200 m. It was found to be 18 cm too long at the end of work after chaining a total distance of 4000 m. What is the true distance if the chain was correct before the commencement of he work?
(A) 3962 m (B) 4019 m
(C) 3981 m (D) 4038 m

24. In a newmark's influence chart for stress distribution there are 10 concentric circles and 50 radial lines the influence factor of the chart is?
(A) 0.0002 (B) 0.002
(C) 0.02 (D) 0.2

25. Before testing setting time of cement one should test for.
(A) Strength (B) Soundness
(C) Fineness (D) Consistency

26. Consider the following statements: Fibre saturation point in wood is reached when
(a) Free water is removed
(b) Cell water is removed
(c) Shrinkage of wood is rapid
(d) Strength gain is rapid
Which of the following statements are correct.
(A) (a) (c) and (d) only
(B) (a) and (b) only
(C) (b) and (d) only
(D) (a), (b) and (c) only

27. Match List-I (process) with List-II (biological agent) and select the correct answer using the codes given below the list :

	List-I (Process)	List-II (Biological agent)
(a)	Oxidation ditch	(i) Facultative bacteria
(b)	Waste Stabiliz-ation pond	(ii) Anaerobic bacteria
(c)	Imhoff tank	(iii) Aerobic bacteria (suspended culture)
(d)	Rotating biolog ical contractor (RBC)	(iv) Aerobic bacteria (attached culture)

Codes:

	(a)	(b)	(c)	(d)
(A)	(iv)	(i)	(ii)	(iii)
(B)	(iii)	(i)	(ii)	(iv)
(C)	(i)	(ii)	(iii)	(iv)
(D)	(iii)	(iv)	(i)	(ii)

28. For a sand having an internal friction of 30^0, the ratio of passive to active lateral earth pressure is :
(A) 1 (B) 3
(C) 6 (D) 9

29. What is the adoptable maximum spacing between vertical stirrups in an RCC beam of rectangular cross-section having an effective depth of 300 mm?
(A) 300 mm (B) 275 mm
(C) 250 mm (D) 225 mm

30. Assertion (A):
In a helically reinforced concrete column, the concrete core is subjected to triaxial state stress.
Reason (R):
Helically reinforced concrete columns are very much suitable for earthquake resistant structures.
(A) both (A) and (R) are true and (R) is not a correct explanation of (A)
(B) both (A) and (R) are true and (R) is not a correct explanation of (A)
(C) (A) is true but (R) is false
(D) (A) is false but (R) is true

31. The shear force on a beam is proportional to :
(A) curvature of the axis
(B) displacement of the axis
(C) sum of the forces
(D) sum of the transverse forces

32. A propped cantilever beam of span L and constant plastic moment capacity M_p carries a concentrated load at mid span, then the load at collapse will be:
(A) M_p/L (B) $6M_p/L$
(C) $4M_p/L$ (D) $2M_p/L$

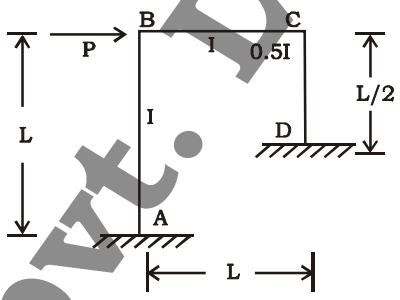
33. A crane with two wheels per side has a capacity of 50 kN. Weight of the crane is 100 kN weight of the trolley is 10 kN and the span is 12 m. The maximum wheel load with hook clearance from the wheel is
(A) 50 kN (B) 52.5 kN
(C) 55 kN (D) 60 kN

34. Soundness test of cernent is carried out to determine its:
(A) alumina content
(B) iron oxide content
(C) free lime content
(D) durability see water

35. A bar of diameter 30 mm is subjected to a tensile load such that the measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0045 mm. The Poisson's ratio will be:
(A) 1/4 (B) 1/3
(C) 1/5 (D) 1/6

36. The shape of recession limb of a hydrograph depends on:
(A) basin as well as storm characteristics
(B) storm characteristics only
(C) basin characteristics only
(D) base flow only

37. The given figure shows a portal frame with one end fixed and other hinged. The ratio of hte fixed end moments M_{BA}/M_{CD} due to side sway will be equal to:



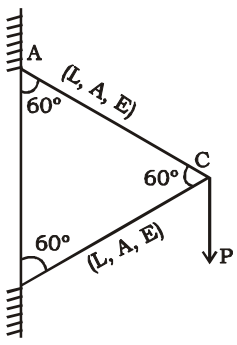
(A) 1.0 (B) 2.0
(C) 2.5 (D) 3.0

38. Consider the following statements pertaining to CPM network analysis:
(A) it is event - oriented method
(B) it is activity - oriented method
(C) time and cost are controlling factors
(D) time alone is controlling factor
Which of these statements are correct?
(A) (a) and (b) (B) (b) and (c)
(C) (c) and (d) (D) (a) and (d)

39. A soil has a liquid limit of 45% and lies above the A-line when plotted on a plasticity chart. The group symbol of the soil as per IS soil classification is:
(A) CH (B) CI
(C) CL (D) MI

40. In under-reamed pile construction, the ratio of shaft diameter to bulb diameter is:
(A) 1/1.5 (B) 1/2
(C) 1/2.5 (D) 1/4

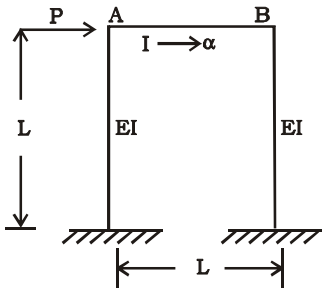
41. The vertical deflection of joint C of the frame shown below:



(A) PL/AE (B) 2PL/AE
(C) PL/2AE (D) 3PL/AE

42. The coefficient of variation of the rainfall for six rain gauge stations in catchment was found to the 29.65%. For 10% admissible error in the estimation of the mean rainfall, the optimum number of additional rain-gauge stations needed to be installed in the catchment are:
(A) 6 (B) 5
(C) 3 (D) 2

43. For the rigid rame shown in the figure below, the force required for movimng the girder AB through a horizontal displacement Δ is given by:



(A) $6EI\Delta/L^3$ (B) $8EI\Delta/L^3$
(C) $9EI\Delta/L^3$ (D) $15EI\Delta/L^3$

44. The most important purpose of frog in a brick is to:
(A) emboss manufacturer's name
(B) reduce the wight of the brick
(C) form keyed joint between brick and mortar
(D) improve insulation by providing hollows

45. A concrete beam of rectangular cross setion of 200 mm × 400 mm is prestressed with a force of 400 kN at an eccentricity of 100 mm. The maiximum compressive stres in the concrete is:
(A) 12.5 N/mm^2
(B) 7.5 N/mm^2
(C) 5.0 N/mm^2
(D) 2.5 N/mm^2

46. If the shape factor of a section is 1.5 and the factor of safety of be adopted is 2.then the load factor will be :
(A) 3 (B) 4
(C) 1.5 (D) 2

47. A propped cantilever ocf span L is subjected to a concentrated load at mid span. If M_p is the value of the plastic capacity of the beam, the value of collapse load will be:
(A) $12M_p/L$ (B) $8M_p/L$
(C) $6M_p/L$ (D) $4M_p/L$

48. The liquid limit and plastic limit of sample are 65% and 29% respectively. The soil fraction with grain sinen finer than 0.002 mm is 24%. The activity ratio of the soft sample is :
(A) 0.50 (B) 1.00
(C) 1.50 (D) 2.00

49. Long term elastic modulus in terms of creep coefficient (θ) and 28-days characteristics strength (f_{ex}) is given by:
(A) $\frac{5000\sqrt{f_{ck}}}{1+\theta}MPa$
(B) $\frac{50000\sqrt{f_{ck}}}{1+\theta}MPa$
(C) $\frac{5000 f_{ck}}{1+\sqrt{\theta}}MPa$
(D) $\frac{5000\sqrt{f_{ck}}}{\sqrt{1+\theta}}MPa$

50. Gantt charts indicate :
(A) comparison of actual progress with the scheduled progress
(B) balance of work to be done
(C) progressive costs of project
(D) inventory costs

51. A structural member carrying a pull of 700 kN is connected to a gusset plate using rivets of 20 mm diameter. If the pull required for shearing the rivets, to crush the rivets and to tear the plate per pitch the length are 60 kN, 35 kN and 70 kN respectively, then the number of rivets required is :
(A) 12 (B) 18
(C) 20 (D) 22

52. The relation between the bending moment (M) and the transverse loads (W_1) is given by:
(A) $M = \Sigma W_1 x_1$ (B) $M = \Sigma W_1 x_1^2$
(C) $M = \Sigma W_1 x_1/4$ (D) $M = \Sigma W_1 x_1^2/2$
When- x_1 , - distance of W_1 from the point about which the moment is taken.

53. The outstand of the flange of build-up beams from the line of connection should not extend beyond.

(A) 10t (B) 85t

(C) $256t/\sqrt{f_y}$ (D) $180t_w$

where t is the thickness of flange and t_w is the thickness of the web.

54. A round steel bar is of length 40 cm consists of two equal portions of 20 cm, each having diameters of 10 cm and 8 cm respectively Take E as 2×10^6 kg/cm^2. If the rod is subjected to a tensile load of 10 tonnes, the elongation in cm will be given by

(A) $\frac{1}{10\pi}\left(\frac{1}{25}+\frac{1}{16}\right)$ (B) $\frac{2}{10\pi}\left(\frac{1}{25}+\frac{1}{16}\right)$

(C) $\frac{3}{10\pi}\left(\frac{1}{25}+\frac{1}{16}\right)$ (D) $\frac{4}{10\pi}\left(\frac{1}{25}+\frac{1}{16}\right)$

55. The limits of percentage 'p' of the longitudinal reinforcement in a column is:

(A) 0.15% to 2% (B) 0.85% to 4%

(C) 0.8% to 6% (D) 0.8% to 8%

56. Strain energy in torsion of a shaft per unit volume is given by (q is maximum shear stress. E is modulus o(elasticity and G is modulus of rigidity):

(A) $q^2/2G$ (B) $q^2/2E$

(C) $q^2/4G$ (D) $q^2/4E$

57. **Assertion (A) :** In the case of mild steel, the tensile strength (expressed as per unit area) of smaller diameter bars are more than that of larger diameter bars.

Reason (R) : In case of smaller diameter mild steel bars, the ratio of outer hard core to total area (outer hard core + inner soft core) is more.

(A) both (A) and (R) are true and (R) is correct explanation of (A)

(B) both (A) and (R) are true and (R) is not a correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

58. Prestressing force in a wire under thermal stressing can be estimated from which of the following ?

(a) Pressure gauge with jack

(b) Elongation of wire

(c) Temperature rise

Select the correct answer using the codes given below:

(A) (a) and (b) only (B) (a) and (c) only

(C) (b) and (c) only (D) (b) only

59. A linked bar chart is an improvement over a conventional bar chart, because :

(a) resources for individual activities can be planned

(b) floats will be available for utilization as needed

(c) milestone events need not be specifically monitored

Which of these is/are correct ?

(A) (a), (b) and (c) (B) (c) only

(C) (b) only (D) (a) only

60. What is the anchorage value of a standard hook of a reinforcement in compression that shall not be less than

(A) 30Φ (B) 24Φ

(C) 20Φ (D) 15Φ

61. Match List -1 (type of water source) with List - II (treatment required) and select the correct answer using the codes given below the lists:

List - 1 (Type of water source)

(a) Surface water (river/canal)

(b) Water of infiltration gallery

(c) Lake/pond water

(d) Tube-well water

List - II (Treatment required)

(i) Aeration, coagulation Sedimentation, and disinfection

(ii) Disinfection

(iii) $CuSO_4$ treatment, coagulation, sedimentation, filtration and disinfection

(iv) Coagulation, flocculation, sedimentation,filtration and disinfection.

Codes:

	(a)	(b)	(c)	(d)
(A)	(iv)	(i)	(iii)	(ii)
(B)	(i)	(iv)	(iii)	(ii)
(C)	(i)	(iv)	(ii)	(iii)
(D)	(iv)	(i)	(ii)	(iii)

62. The basic stress in masonry unit having height to width ratio of 1.5 may be increased by a factor of :

(A) 1.2 (B) 1.4

(C) 1.6 (D) 2.0

63. When the load line coincides with the centroid of the rivet group, the rivets are subjected to:

(A) shear only

(B) tension only
(C) bending only
(D) shear as well as tension

64. In a concrete pavement, during summer at noon and soon after mid-day, the combined stress at the interior of the slab is equal to:
(A) Wheel load stress + Temperature warping stress + Sub grade resistant stress
(B) Wheel load stress + Temperature warping stress - Sub-grade resistant stress
(C) Wheel load stress - Temperature warping stress + Sub "grade resistant stress
(D) Wheel load stress - Temperature warping stress - Sub grade resistant stress

65. The discharge over a triangular notch is :
(A) Inversely proportional to $H^{3/2}$
(B) Directly proportional to $H^{3/2}$
(C) Inversely proportional to $H^{5/2}$
(D) Directiy proportional to $H^{5/2}$

66. In which treatment unit Schmutzdecke layer is formed ?
(A) Sedimentation tank
(B) Rapid sand filter
(C) Coagulation tank
(D) Slow sand filter

67. For a pair of identical steel channel sections, tacked - welded as a tension element. What is the net area of cross -section for design purposes ?
(A) net area of the webs only
(B) net area of the flanges only
(C) net area of the webs and flanges
(D) web area plus a portion of the area of the flanges.

68. Match List-I with List - II and select the correct answer using the codes given below the lists :

List-I
(a) Ductility
(b) Brittleness
(c) Tenacity
(d) Toughness

List-II
(i) Failure without warning
(ii) Drawn permanently over changes of shape without
(iii) Absorption of energy at high stress without rupture
(iv) High tensile strength

Codes:

	(a)	(b)	(c)	(d)
(A)	(i)	(ii)	(iv)	(ii)
(B)	(i)	(ii)	(iii)	(iv)
(C)	(ii)	(iii)	(iv)	(i)
(D)	(ii)	(i)	(iv)	(iii)

69. Which one of the following statements regarding coefficient of consolidation C_v is correct ?
(A) $C_v \propto k$ (B) $C_v \propto 1/k$
(C) $C_v \propto m_v$ (D) $C_v \propto a_v$

70. The angle between the axis of a beam and normal to the transverse plane in beams subjected to pure bending moment is :
(A) 90°
(B) 0°
(C) close to but not equal to 0°
(D) close to but not equal to 90°

71. In a canal irrigation project, 76% of the culturable command area (CCA) remained without water during Kharif season; and 58% of CCA remained without water during Rabi season in a particular year. Rest of the areas got irrigated in each crop respectively. What is the intensity of irrigation for the project in the year ?
(A) 134% (B) 76%
(C) 66% (D) 58%

72. In critical path network, which of the following are involved ?
(a) a series of interconnected activities
(b) considerations for uncertainties in time estimate
(c) a logical sequence of activities is provided
(d) the node number at the arrow head is numerically smaller than that at tail end
(A) (a) and (b) (B) (b) and (c)
(C) (c) and (d) (D) (D) (a) and (c)

73. The deflection can be controlled by using the appropriate :
(A) aspect ratio
(B) modular ratio
(C) span/width ratio
(D) water/cement ratio

74. A circular segment three hinged arch of span 36 m and a rise of 6 m hinged at the crown and springing It carries a horizontal load of 1000 N/m covering full height of the arch on left side The horizontal thrust on

the right springing will be :
(A) 6000 N (B) 4500 N
(C) 3000 N (D) 1500 N

75. For a circular curve of radius 200 m, the coefficient of lateral friction of 0.15 and the design speed of 40 kmph. The equilibrium super elevation (for equal pressure on inner and outer wheel) would be:
(A) 21.3% (B) 7%
(C) 6.3% (D) 4.6%

76. Two long pipes in parallel are used to carry water between two reservoirs. ThE diameter of one pipe is twice that of the other. Both pipes have the same valued friction factor. Neglect minor loses. What is the ratio of flow rates through the two pipes ?
(A) 2.8 (B) 5.6
(C) 8 (D) 11.3

77. Resilience is :
(A) maximum strain energy
(B) recoverable strain energy
(C) total potential energy
(D) shear strain energy (beyond Hooke's Law)

78. Four main oxides present in Ordinary Portland Cement (OPC) are : CaO, Al_2O_3 SiO_2 and Fe_2O_3. Identify the correct ascending order of their proportions in a typical composition of OPC
(A) Al_2O_3, Fe2O_3, CaO, SiO_2
(B) Al_2O_3, CaO, Fe_2O_3, SiO_2
(C) Fe_2O_3, Al_2O_3, SiO_2, CaO
(D) Fe_2O_3, SiO_3, Al_2O_3, CaO

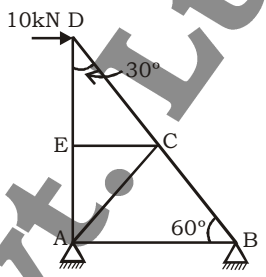
79. How is the depth of footing for an isolated column governed ?
(a) by maximum bending moment
(b) by shear force
(c) by punching shear
Select the correct answer using the codes given below:
(A) (b) and (c) only (B) (a) and (b) only
(C) (a) and (c) only (D) (a) (b) and (c)

80. The profits and associated probability of making the profits are given below ln respect of four projects :

Project	Profit	Probability of making the profit
1	15%	0.5
2	10%	0.8
3	12%	0.7
4	11%	0.6

When the motive is maximum of expected profit, the correct order of preference of these projects would be :
(A) 1, 3, 4, 2 (B) 2, 3, 4, 1
(C) 3, 2, 1, 4 (D) 3, 4, 2, 1

81. Member(s) of the frame shown below which carries/cany zero forces is/are



(A) EC only (B) EC and AB
(C) EC and AC (D) EC, AC and AB

82. Grade compensation on a 4° curve one broad gauge railway track is :
(A) 0.20% (B) 0.16%
(C) 0.12% (D) 0.08%

83. Creep of a material is a property indicated by:
(A) a time dependent strain of the material
(B) elongation of the material due to cnanges in the material properties
(C) shortening caused by shrinkage of the material
(D) the decrease in the volume of the material affected by the weather conditions.

84. One of the main demerits in using the lime mortar is that it :
(A) is not durable
(B) does not set quickly
(C) swells
(D) is plastic

85. Specific capacity of a well is the :
(A) volume of water that can be extracted by the force of gravity from a unit volume of aquifer
(B) discharge per unit drawdown of the well
(C) drawdown per unit discharge of the well
(D) rate of flow though a unit width and entire thicks of aquifer

86. A 12 5 ml. sample of treated wastewater requires 187.5 mL of odor-free distilled water to reduce the odor to a level that is just perceptible. What is the threshold odor

number (TOM) for the wastewater sample?
(A) 0.07 (B) 1.07
(C) 15 (D) 16

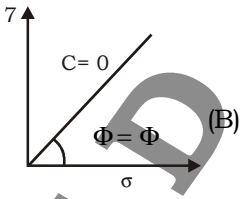
87. After which of the following treatment units, the turbidity is maximum ?
(A) Chlorination
(B) Primary sedimentation
(C) Flocculation process
(D) Secondary sedimentation

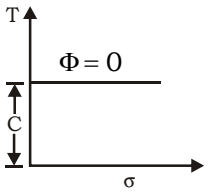
88. If the eccentricity of total self-weight W of a masonry dam at its base is equal to one-forth of base width B, then the maximum pressure at the base is given by:
(A) 2W/3B (B) 4W/3B
(C) 5W/2B (D) 8W/3B

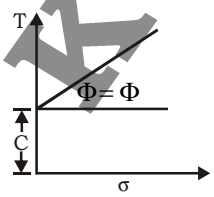
89. A bed of sand consists of three horizontal; layers of equal thickness. The value of Darcy's coefficient of permeability (k) for the upper and lower layers if 1×10^{-2} cm/sec and for middle laver to 1×10^{-1} cm/sec. The ratio permeability of the bed in the horizontal direction to that in vertical dirction is:
(A) 10.0 to 1 (B) 2.8 to 1
(C) 2.0 to 1 (D) 1 to 1.1

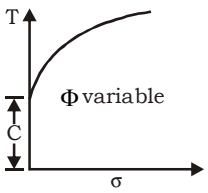
90. The correct statement of comparison of ultimate BOD, COD, theoretical oxygen demand (ThOD) and 5 day BOD (BOD_5) is:
(A) $BOD_u > COD > ThOD > BOD_5$
(B) $COD > ThOD > BOD_u > BOD_5$
(C) $ThOD > COD > BOD_u > BOD_5$
(D) $COD > BOD_u > BOD_5 > ThOD$

91. Which one of the following figure given the failure envelope for normally consotidanted saturated clay sample rested is triaxial test under drained conditions?

(A) 

(B) 

(C) 

(D) 

92. Steel structures are ideally suitable for impact loads because they have high
(A) toughnose value
(B) elastic modulus
(C) design stress
(D) plastic modulus

93. A cement bag contains 0.035 cubic meter of cement by volume. How many bags will one tonne (1000 kg) of cement comprise?
(A) 16 (B) 17
(C) 18 (D) 20

94. If q the punching shear resistance pet unit area a, in the side of a square footing for a column of aide b, carrying a weight W including the weight of the footing, the depth (D) of the footing from punching shear consideration, is :

(A) $D = \frac{W(a-b)}{4a^2bq}$ (B) $D = \frac{W(a^2-b^2)}{4a^2bq}$

(C) $D = \frac{W(a^2-b^2)}{8a^2bq}$ (D) $D = \frac{W(a^2-b^2)}{4abq}$

95. The maximum permissible slenderness ratio for masonry wall is:
(A) 40 (B) 30
(C) 20 (D) 10

96. Which of the following project management techniques is determinstic in nature?
(A) CPM (B) PERT
(C) GERT (D) LCES

97. The fineness of cement is tested by :
(A) Air-content method
(B) Air-permeability method
(C) Le-Chatelier method
(D) Vicat's apparatus

98. The chances of diagonal tension cracks in R.C.C. member reduce when :
(A) axial compression and shear force act simultaneously
(B) axial tension and shear force act simultaneously
(C) only shear force act
(D) flexural and shear force act

99. In a closed traverse ABC, following readings were taken

Line	Force Bearing	Back Heating
AB	20°	201°
BC	101°	278°
CA	278°	50°

Station A is free from local attraction Correct bearing of CB is:
(A) 275° (B) 276°
(C) 281° (D) 280°

100. The live load for a sloping roof with slop 15°. where acces to not provided to the roof is taken as :
(A) 0.65 kN/m² (B) 0.75 kN/m²
(C) 1.35 kN/m² (D) 0.50 kN/m²

Answer-key & Solution

HARYANA SDO
Date 9/ 10/ 2017

1	B	16	A	31	D	46	A	61	A	76	B	91	A
2	B	17	C	32	B	47	C	62	A	77	B	92	A
3	D	18	B	33	B	48	C	63	A	78	C	93	D
4	A	19	B	34	C	49	A	64	C	79	D	94	B
5	B	20	B	35	B	50	A	65	D	80	C	95	B
6	D	21	A	36	C	51	C	66	D	81	C	96	A
7	A	22	C	37	A	52	A	67	D	82	B	97	B
8	D	23	B	38	B	53	C	68	D	83	A	98	A
9	B	24	B	39	B	54	A	69	A	84	B	99	D
10	D	25	D	40	C	55	C	70	B	85	B	100	A
11	D	26	A	41	B	56	C	71	C	86	D		
12	D	27	B	42	C	57	C	72	D	87	C		
13	B	28	D	43	A	58	C	73	A	88	D		
14	A	29	D	44	C	59	A	74	D	89	B		
15	D	30	B	45	A	60	B	75	C	90	C		

Note : *If your opinion differ regarding any answer, please message the mock test and Question number to 9560620353*

Note : *If you face any problem regarding result or marks scored, please contact : 9313111777*

Solution

1.(A) FI = $\frac{100}{500}\times 100 = 20\%$,

E.I = $\frac{80}{100}\times 100 = 16\%$,

Total = 20+16 = 36%

6.(D) Slope of sewer A = 1 in 100

Slope of sewer B = 1 in 400

Maning's formula

$$V = \frac{1}{n}R^{2/3}(s)^{1/2}$$

$$V_A = \frac{1}{n}R^{2/3}\left(\frac{1}{100}\right)^{1/2}$$

$$\frac{V_A}{V_B} = \frac{1}{n}R^{2/3}\left(\frac{1}{400}\right)^{1/2}$$

$$= \left(\frac{400}{100}\right)^{1/2} \Rightarrow \frac{V_A}{V_B} = 2$$

7.(A) Taylor's stability No.

$$S_\eta = \frac{\tau}{\gamma H} = \frac{1}{2\times 5} = 0.1$$

$S_n = 0.1$

9.(B) [C= –0.6728d²]..... in m

where d in km

$$\therefore C = -0.06728\times\frac{1400}{1000} = 0.132$$

12.(D) Q= Ci A

C= 0.4

$$i = 45 \text{ cm/hr} = \frac{4.5}{100}\times\frac{1}{60\times 60} \text{ m/s}$$

15. (D) Time = 300 day H = 5m

Drainage is doubled

$$\frac{t_2 = T_v\frac{d_1^2}{C_v}}{t_2 = T_v\frac{d_2^2}{C_v}}$$

$$\frac{300}{t_2} = \frac{\left(\frac{5}{2}\right)^2}{(5)^2} = t_2 = 1200 \text{ days}$$

17.(C) Gradients given as 'g_1' and 'g_2'

r is the rate of change of grade per curve length of vertical curve

$$= \frac{\text{Change in gradient}}{\text{Permissible rate of change of gradient}}$$

length of vartical curve = $\left[\frac{g_1 - g_2}{r}\right]$

23.(B) Chain length used for measurement = 20 m

chain is 10 cm long after measuring 2000 m. and later on , finally the chain was 18 cm long after measuring total 400 m distance. Incorrect length for 1st 2000m is given as

$$l_1 = \frac{20+20.1}{2} = 20.05 \text{ m}$$

similarly = $l_2 = \frac{20.1+20.18}{2} = 20.14$ m

True distance = $\left(\frac{\text{incorret length}}{\text{True length}}\right)$(Measured distance)

$$= \left(\frac{20.05}{20}\right)2000 + \left(\frac{20.14}{20}\right)2000 = 4019 \text{ m}$$

24.(B) Network's influance

$$\text{Co-efficient} = \frac{1}{\text{No. of} \times \text{No. circles Pas}}$$

$$= \frac{1}{10\times 50} = 0.002$$

25.(D) Consistency of cement permit the vicat plunger to penetrate to a point 5mm to 7 mm drop bottom of the vicat mould

28.(D) $K_a = \frac{1-\sin 30^0}{1+\sin 30^0} = \frac{1}{3}$

$$K_p = \frac{1+\sin 30^0}{1-\sin 30^0} = 3$$

$$\therefore \frac{K_p}{K_a} = \frac{3}{\left(\frac{1}{3}\right)} = 9$$

29.(D) Spacing of verticle striupps

$\not> .75d = .75\times 300 = 225mm \not> 300mm$

So $\Rightarrow$ 225mm

30.(B) Both are correct but (R) is not correct explanation of (A)

31.(D) Algebraic Sum of transverse force.

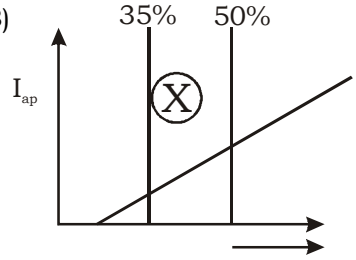
35.(B) Poission Ratio: $\frac{\text{Lateral strain}}{\text{Longitudinal strain}}$

$$= \frac{-\left(\frac{0.0045}{30}\right)}{\left(\frac{0.09}{200}\right)} = \frac{1}{3}$$

36.(C)

- Recession limb is remaining portion of the huydrograph wchich may or may not reduce to Zero
- It is also known by Recessing limb
- It show the withdrawal of water draw storege of the the occureance of excess rainfuall
- Its shape is only depend upon the catchment area (ie basin characteristic only)

39. (B)



X = CI

40.(C) The ratio of shaft diameter ot bulb diameter is range between $\frac{1}{2}$ to $\frac{1}{3}$ Bus usually this value is considered as $\frac{1}{2.5}$

42. (B) No of optinum Raingauage

$$= \left(\frac{W}{E}\right)^2$$

$$= \left(\frac{29.65}{10}\right)^2$$

$N \simeq 9$

given Rain gauge = 6

Required = 9 – 6 = 3

45.(A) Compressive stress = $\frac{P}{A} \mp \frac{Pe}{Z}$

$$\frac{400\times10^3}{(200\times400)} \mp \frac{400\times10^3\times100}{5.33\times10^6}$$

$$Z = \frac{BD^2}{6} = \frac{200\times400^2}{6} = 5.33\times10^6\ mm^3$$

$= 5 \mp 7.5 = -2.5$ MP = +12.5 MPa

46.(A) Load factor = (factor of safety) ×shape factor) = 2 × 1.5 = 3

49.(A) $E_{ce} = \frac{5000\sqrt{fck}}{1+\theta}$

50.(A) Gantt chart is the chart which usually used in project management and it is effective tool to represent activites (event. work, task etc) against time (i.e. duration)

51.(C) Pull (P) = 700

P_S= (Shear strangth of rivet) = 60 kN)

P_b = (bearing strangth of rivet) = 35 kN

$$R_V = \left.\frac{P_S}{P_b}\right\} \text{minimum} \therefore R_V = 35\ kN$$

$$\therefore \text{No of Rivet} = \frac{700}{35} = 20$$

54.(A) $\Delta l = \frac{PL}{AE} = \frac{P_1L_1}{A_1E_1} + \frac{P_2L_2}{A_2E_2}$

$P_1 = P_2 = 10\times10^3$ kg = P = 10^4 kg

$L_1 = L_2$ = 20 cm = L

$E_1 = E_2 = 2\times10^6$ cm = E

$$\therefore \Delta l = \frac{PL}{AE}\left[\frac{1}{A_1} + \frac{1}{A_2}\right]$$

$$= \frac{10^4\times20}{2\times10^6}\left[\frac{1}{\frac{\pi}{4}\times10^2} + \frac{1}{\frac{\pi}{4}\times8^2}\right]$$

$$= \frac{4\times10^4\times20}{\pi\times2\times10^6}\left[\frac{1}{100} + \frac{1}{64}\right]$$

$$\Delta l = \frac{1}{10\pi}\left[\frac{1}{100} + \frac{1}{64}\right]$$

55.(C) Maximum % in column = 6%

Minimum in column = 0.80%

So .80 to 6%

55.(C) As per is 956 : 2000

56.(C) (U) = $\frac{1}{2}T\theta = \frac{1}{2}\frac{T^2L}{GJ} = \frac{\tau}{4G}\times Vol.of\ shaft$

= S.I/volume = $\frac{\tau^2}{4G} ie \frac{V^1}{4G}$ (τ = q)

57.(C) It is because small dia bars with more number coil increase the contact area (finally give the weigth tensile strength in compare with large dia bars of same Ast.

60.(B) Minimum anchorage length for bar in compression = 24ϕ

66.(D) A twin layers over filter medium in which

biological activity occur is known as Schmutzteche. It generated only in slow saw tiller.

69.(A) $C_V = \dfrac{K}{m_V \gamma_w}$

71.(C) I0I for ..... = 100 – 76 = 24Q%
I0I for ..... = 100 – 52 = 42%
Total ..... 24 + 42 = 60%

73.(A) aspect ratio = $\dfrac{Span}{Depth}$

75.(C) R = 200m
f = 0.15%
V = 40 kmph

$e = \dfrac{V^2}{127R}$

$= \dfrac{40^2}{127 \times 200} = 0.0.63$

= 6.3%

76.(B) $\dfrac{4 f_1 L_1 V_1^2}{2.g.D_1} = \dfrac{4 f_2 L_2 V_2^2}{2gD_2}$

Given $f_1 = f_2$
assume $L_1 = L_2$

$\dfrac{V_1^2}{D_1} = \dfrac{V_2^2}{D_2}$

or $\dfrac{Q_1^2}{D_1^s} = \dfrac{Q_2^2}{D_2^5}$

$\dfrac{Q_1}{Q_2} = \left[\dfrac{D_1}{D_2}\right]^{5/2} = [2]^{2.5}$

$\dfrac{Q_1}{Q_2} = 5.65$

79.(D) Depth of footing for chcek for all BM, shear force and punching shear

82. (B) Grade compensation
= .04% per degree curve (BG)
= .04 ×4%
= .16%

83.(A) CREEP is permanent deformation recorded with passage of time at constant loading

86.(D) Vol. of sample – 12.5ml.
Vol. of water = 187.5ml.

D.f. $= \dfrac{187.5 + 12.5}{12.5} = 16$

88.(D) $p_{max} = \dfrac{2W}{3\left(\dfrac{B}{2}e\right)}$

masonary dam can not take tension

$e = \dfrac{B}{4}$

$P_{max} = \dfrac{2W}{3\left(\dfrac{B}{2} - \dfrac{B}{4}\right)} = \dfrac{8W}{3B}$

89.(B) Total layers = 3
thickness of each layer = H
$k_1 = k_3 = 1 \times 10^{-2}$cm/s
$k_2 = 1 \times 10^{-1}$ cm/s

$k_h = \dfrac{k_1 z_1 + k_x z_2 + k_3 z_3}{z_1 + z_2 + z_3}$

$= \dfrac{1 \times 10^{-2}(H) + 1 \times 10^{-1}(H) +}{3H}$

$k_H = 0.04$

$k_v = \dfrac{z_1 + z_2 + z_3}{\dfrac{z_1}{k_1} + \dfrac{z_2}{k_2} + \dfrac{z_3}{k_3}} = \dfrac{H + H + H}{\dfrac{H}{10^{-2}} + \dfrac{H}{10^{-1}} + \dfrac{H}{10^{-2}}}$

$k_V = \dfrac{1}{70}$

$\dfrac{k_H}{k_V} = \dfrac{0.04}{\dfrac{1}{70}} = \dfrac{2.8}{1}$

2.8 to 1