BARC 2019
Civil Engineering

Free Mock Test

gradeup

1. Match List-I (Admixture) with List-II (Action in concrete) and select the correct answer using the codes given below the lists:
List-I
A. Calcium Lignosulphonate
B. Aluminium powders
C. Tartaric acid
D. Sodium silicate
List-II
1) Accelerators
2) Retarder
3) Air entrainer
4) Water reducer
Codes:
A. A-1; B-3; C-2; D-4;
B. A-4; B-3; C-2; D-1;
C. A-4; B-2; C-3; D-1;
D. A-1; B-2; C-3; D-4;

2. Consider the following statements:
1) Dry rot in sap wood is caused by fungal attack.
2) Brown rot in coniferous woods is a result of fungal attack.
3) Alternate wetting and drying of unseasoned timber causes 'powdery' form of decay in wood.
Which of these statements are correct?
A. 1, 2 and 3
B. 1 and 2 only
C. 2 and 3 only
D. 1 and 3 only

3. Consider the following statements about lime:
1) Calcination of limestone results in quick lime.
2) Lime produced from pure variety of chalk is hydraulic lime.
3) Hydrated lime is obtained by treating quick lime with water.
Which of the above statements are correct?
A. 1, 2 and 3 B. 1 and 2 only
C. 2 and 3 only D. 1 and 3 only

4. Consider the following statements:
1) The compressive strength of concrete decreases with increase in water-cement ratio of the concrete mix.
2) Water is added to the concrete mix for hydration of cement and workability.
3) Creep and shrinkage of concrete are independent of the water-cement ratio in the concrete mix.
The true statements are
A. 1 and 2
B. 1, 2 and 3
C. 2 and 3
D. only 2

5. If aggregate size of 50-40 mm is to be tested for determining the proportion of elongated aggregates, the slot length of the gauge should be
A. 45 mm B. 53 mm
C. 81 mm D. 90 mm

6. A bar *AB* of diameter 40 mm and 4 m long is rigidly fixed at its ends. A torque 600 N-m is applied at a section of bar, 1 m from end *A*. The fixing couples T_A and T_B at the supports *A* and *B*, respectively are
A. 200 N-m and 400 N-m
B. 300 N-m and 150 N-m
C. 450 N-m and 150 N-m
D. 300 N-m and 100 N-m

7. The power transmitted by a 75 mm diameter shaft at 140 r.p.m. subjected to a maximum shear stress of 60 N/mm^2, is nearly
A. 68 kW B. 70 kW
C. 73 kW D. 76 kW

8. A beam of square cross-section is placed such that its neutral axis coincides with its diagonal and it is subjected to a shear force F. What is the ratio of the maximum shear stress to the shear stress at the neutral axis?
A. 9/8 B. 8/9
C. 7/8 D. 8/7

9. The intensity of u.d.l. which when its acts over the entire span of 1 m of a cantilever beam of a rectangular cross-section of width 100 mm and depth 200 mm would produce a maximum shear stress of 1.5 N/mm^2 is
A. 20 kN/m
B. 30 kN/m
C. 26.6 kN/m
D. 36.6 kN/m

10. Match List-I (Load Case) with List-II (Expression for slope/Deflection for Cantilever beam) and select the correct answer using the codes given below the lists (Flexural rigidity = EI) :

List-|

A) Slope at tip of point load W
B) Deflection at tip load of W
C) Slope at end under total UDL of W
D) Deflection at end under total UDL of W

List-||

1) $WL^3/8EI$
2) $WL^2/6EI$
3) $WL^3/3EI$
4) $WL^2/2EI$

A. A-4; B-2; C-3; D-1
B. A-1; B-3; C-2; D-4
C. A-4; B-3; C-2; D-1
D. A-1; B-2; C-3; D-4

11. At a certain point in a structural member, there are perpendicular stresses 80 N/mm^2 and 20 N/mm^2, both tensile. What is the equivalent stress in simple tension, according to the maximum principal strain theory?
(Poisson's ratio = 0.25)
A. Zero B. 20 N/mm^2
C. 60 N/mm^2 D. 75 n/mm^2

12. In a strained material, the principal stresses in the *x* and *y* directions are 100 N/mm^2 (tensile) and60 N/mm^2 (compressive). On an inclined plane, the normal to which makes an angle 30 ° to the x-axis, what is the tangential stress in N/mm^2?
A. $30\sqrt{3}$ B. $40\sqrt{3}$
C. 60 D. 40

13. A steel rod, 100 mm long is held between two rigid supports. It is heated by 20^{o}C. The supports yield by 0.01 mm. If the coefficient of thermal expansion of the material of the rod is 15 × 10^{-6}per^{0}C and modulus of elasticity is 200 × 10^3 MN/m^2, What is the stress in the rod?
A. 20 MN/m^2 B. 40 MN/m^2
C. 60 MN?m^2 D. 80 MN/m^2

14. A 20 cm lon g rod of uniform rectangular section 8 mm wide × 1.2 mm thick is bent into the form of a circular arc resulting in a central displacement of 0.8cm. Neglecting second-order quantities in computations, what is the longitudinal surface strain (approximate) in the rod?
A. 7.2 × 10^{-4} B. 8.4 × 10^{-4}
C. 9.6 × 10^{-4} D. 10.8 × 10^{-4}

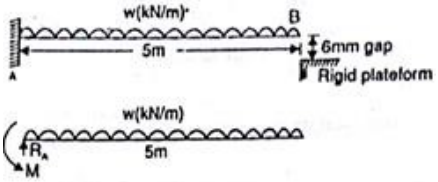
15. A square steel bar 50 mm side and 5 m long is subjected to a load where upon it absorbs a strain energy of 100J. What is its modulus of resilence?
A. $\frac{1}{125} N-mm/mm^3$
B. $125mm^3/N-mm$
C. $\frac{1}{100} N-mm/mm^3$
D. $100mm^3/N-mm$

16. Two plates each of 50 mm × 50 mm section are glued together along the length to form a section 50 mm × 100 mm, used as a beam. If the shear force at a section is 1000 N. What is the maximum shear stress on the glue?
A. 0.15 MPa B. 0.3 MPa
C. 0.6 MPa D. 2.4 MPa

17. A simply supported beam of T-section is subjected to a uniformly distributed load acting vertically downward. Its neutral axis is located at 25 mm from the top of the flange and the total depth of the section is 100 mm. The ratio of maximum tensile stress to maximum compressive stress in the beam is
A. 2.0 B. 2.5
C. 3.0 D. 4.0

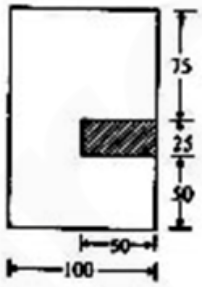
18. A thin cylinder shell made of mild steel plate is 1000 mm in diameter. It is to be subjected to an internal pressure of 2 N/mm^2. If the material yields at 200 N/mm^2, the thickness of the plate in mm on the basis of Rankine's theory of failure with assuming a factor of safety of 3 would be
A. 10 B. 12
C. 15 D. 18

19. For the linear elastic beam shown in the figure, the flexural rigidity, EI, is 781250 kN-m^2. When w = 10 kN/m, the vertical reaction R_A at A is 50 kN. The value of $R_A$for w = 100 kN/m is



A. 500 kN B. 425 kN
C. 250 kN D. 74 kN

20. A beam with the cross-section given below is subjected to a positive bending moment (causing compression at the top) of 16 kN-m acting around the horizontal axis. The tensile force acting on the hatchcd area of the cross-section is



A. zero B. 5.9 kN
C. 8.9 kN D. 17.8 kN

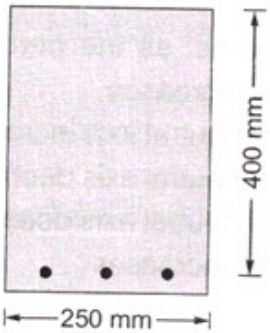
21. The critical section for maximum bending moment in the footing under masonry wall is located at
A. the middle of the wall
B. the face of the wall
C. mid-way between the face and the middle of the wall
D. a distance equal to the effective depth of footing from the face of the wall

22. Shear strength of concrete in a reinforced concrete beam is a function of which of the following:
1) Compressive strength of concrete
2) Percentage of shear reinforcement
3) Percentage of longitudinal reinforcement in tension in the section
4) Percentage total longitudinal reinforce-ment in the section
Select the correct answer using the codes given below:
A. 1, 2 and 4
B. 1, 2 and 3
C. Only 1 and 3
D. Only 1 and 4

23. A singly reinforced rectangular concrete beam has a width of 150 mm and effective depth of 330 mm. The characteristic compressive strength of concrete is 20 MPa and the tensile strength of steel is 415 MPa. Adopt the stress block for concrete as per IS 456-2000 and take the limiting value of depth of neutral axis as 0.48 times the effective depth of the beam for considering as a balanced section. What is the likely approximation for the limiting value of the moment of resistance of the beam?
A. 15 kNm
B. 25 kNm
C. 45 kNm
D. 75 kNm

24. A rectangular 230 mm × 350 mm beam is (effective depth). The factored shear force acting at a section is 80 kN. If the permissible shear stress in concrete is 0 ·25 MPa, the design shear force is nearly
A. 100 kN
B. 80 kN
C. 60kN
D. 20 kN

25. A simply supported RC beam having clear span 5 m and support width 300 mm has the cross-section as shown in figure below.



What is the effective span of the beam as per IS : 456?
A. 5300 mm B. 5400 mm
C. 5200 mm D. 5150 mm

26. The design strength of a tension member is governed by
1) Rupture at a critical section
2) Yielding of gross area
3) Block shear of end region
Select the correct answer using the codes given below:
A. 1 only B. 2 only
C. 3 only D. 1, 2 and 3

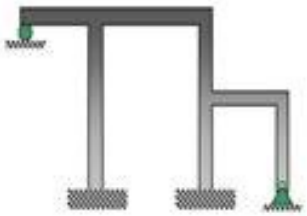
27. In the plastic analysis of a steel beam, which of the following assumptions is/are made?
1) Plane sections under bending remain plane at all stages of bending.
2) The stress-strain relation is bilinear, i.e. consisting of two straight lines.
3) Shear deformations are neglected.
Select the correct answer using the code given below:
A. 1 only B. 2 only
C. 2 and 3 only D. 1, 2 and 3

28. A prismatic beam (shape factor, S) fixed at both ends carries UDL throughout the span. What is the ratio of collapse load to yield load?
A. $\frac{4}{3}S$ B. $\frac{3}{4}S$
C. $\frac{5}{3}S$ D. $\frac{3}{5}S$

29. Match List-I (Shape of structural) with List-II (Shape factor) and select the correct answer using the codes given below the lists:
List-I
A) Rectangular
B) Circular
C) I-section
D) Diamond
List-II
1) 2.0
2) 1.1 to 1.2
3) 1.5
4) 1.7
A. A-3; B-1; C-2; D-4
B. A-2; B-4; C-3; D-1
C. A-3; B-4; C-2; D-1
D. A-2; B-1; C-3; D-4

30. Force method of analysis of a structure is particularly preferred when
1) The degrees of freedom of the structure become large
2) The structure has less number of static, and more number of kinematic, indeterminacies
3) The structure has more numbers of static, and less numbers of kinematic, indeterminacies
A. 1 only B. 2 only
C. 3 only D. 1, 2 and 3

31. The number of degrees of indeterminacy in the frame shown in figure is:



A. 4 B. 6
C. 3 D. 8

32. Muller Breslau's principle is applicable on:
A. trusses
B. statically determinate beams and frames
C. statically indeterminate structures
D. all of above

33. A fixed beam AB is subjected to a triangular load varying from zero at end A to w per unit length at end B. The ration of fixed end moment at B to A will be

A. 1/2 B. 1/3
C. 2/3 D. 3/2

34. Consider the following statements:
1) PERT is activity-oriented and adopts deterministic approach.
2) CPM is event-oriented and adopts probabilistic approach.
3) PERT is event-oriented and adopts probabilistic approach.
Which of these statements is/are correct?

A. 1 only B. 1 and 2
C. 2 and 3 D. 3 only

35. It is estimated that an activity can be assigned an optimistic duration of 16 days, a pessimistic duration of 28 days and a most likely duration of 19 days. What is the expected duration for this activity?

A. 20 days B. 19 days
C. 22 days D. 18 days

36. If the excavation of earth is done manually then it costs Rs. 10 per cum. A machine can excavate at a fixed cost of Rs. 4000 plus a variable cost of Rs. 2 per cum. The quantity of earth for which the cost of excavation by machine will be equal to the cost of manual excavation is

A. 500 cum B. 1000 cum
C. 1500 cum D. 2000 cum

37. Match the following and select correct option.

Type of flow Parameters

List - I

(a) Critical flow

(b) Sub-critical flow

(c) Super critical flow

List – II

(1) $E_1 > E_c, Y_1 > Y_c, V_1 < V_c$

(2) $E_1 = E_c, Y_1 = Y_c, V_1 = V_c$

(3) $E_1 > E_c, Y_1 < Y_c, V_1 > V_c$

a - b - c

A. a-2, b-3, c-1
B. a-3, b-2, c-1
C. a-2, b-1, c-3
D. a-3, b-1, c-2

38. For a given discharge in an open channel, there are two depths which have the same specific energy. These two depths are known as

A. alternate depths
B. critical depths
C. normal depths
D. sequent depths

39. Match the following;

List 1

P. Piezometric Head
Q. Stagnation Head
R. Dynamic Head
S. Static Head

List 2

1) Sum of pressure head and velocity head.
2) Pressure head
3) Velocity head
4) Sum of datum head and pressure head

A. P-2,Q-3,R-1,S-4
B. P-4,Q-1,R-3,S-2
C. P-2,Q-3,R-4,S-1
D. P-4,Q-1,R-2,S-3

40. A stream function is given by $\psi = 2x.2y + (x+1)y^2$. The flow rate in units across a line joining points (2,3) and (5,2) is

A. 51 B. 64
C. 13 D. -13

41. In a wide rectangular channel with uniform flow the specific energy is 1.1m. What is velocity at critical flow? Given,

$\sqrt{2g} = 4.43$

A. 1.6 B. 3.67
C. 2.11 D. 2.70

42. The sequent depths in a hydraulic jump formed in a 4.0m wide rectangular channel are 0.3 m and 1.2 m. The discharge in the channel is _____m^3/s.

A. 3.2 B. 6.5
C. 1.6 D. 4.8

43. Two reservoirs are connected by a pipe of 200mm diameter for a distance of about 4.5 km. Considering the friction coefficient as 0.01 and the difference in water level with the reservoirs as 6.25m, compute the velocity in the pipe (in m/s) considering the system to exhibit exit and entry losses.
A. 0.368 B. 0.136
C. 0.369 D. 0.4

44. A trapezoidal a channel has a bottom width of 6m and slopes of 1:1. The depth of flow is 1.5m at a discharge of 15 m^3/s. Determine the specific energy. If the critical depth is 0.9m, discuss the type of flow corresponding to the critical depth.
A. 1.197, Critical flow
B. 1.197, Sub- Critical flow
C. 1.35, Critical flow
D. 1.35, Sub- Critical flow

45. A rectangular channel 4.5m wide, laid at slope of 0.0040. The uniform flow occurs at a depth of 1.8m. Determine the height of hump to be constructed, such that there is no change in the U/S condition. take n= 0.017
A. 0.125m B. 1.66m
C. 0.015m D. 2.49m

46. A viscious fluid having dynamic viscosity of v at a temperature of T is heated until the temperature of the fluid becomes 4T. Temperature is in Kelvin. The fluid doesnot react on heating and remain isolated from the container where it is kept. Find the viscosity of the fluid under heated condition.
A. 2v B. 2 .5v
C. 3v D. 4v

47. Two electrostatic precipitators (ESPs) are in series. The fractional efficiencies of the upstream and downstream ESPs for size d_p are 80% and 65% respectively. What is the overall efficiency of the system for the same dp?
A. 100% B. 93%
C. 80% D. 65%

48. Solid waste generated from an industry contains only two components, X and Y as shown in the table below

Component	Composition (% weight)	Density (kg/m^3)
X	c_1	ρ_1
Y	c_2	ρ_2

Assuming (c_1 + c_2) = 100, the composite density of the solid waste (ï) is given by :

A. $\frac{100}{\left(\frac{c_1}{\rho_1}+\frac{c_2}{\rho_2}\right)}$

B. $100\left(\frac{\rho_1}{c_1}+\frac{\rho_2}{c_2}\right)$

C. $100(c_1\rho_1+c_2\rho_2)$

D. $100\left(\frac{\rho_1\rho_2}{c_1\rho_1+c_2\rho_2}\right)$

49. An air parcel having 40 °C temperature moves from ground level to 500 m elevation in dry air following the "adiabatic lapse rate". The resulting temperature of air parcel at 500 m elevation will be
A. 35 °C B. 38 °C
C. 41 °C D. 44 °C

50. An analysis for determination of solids in the return sludge of activated sludge process was done as follows: (1) A crucible was dried to a constant mass of 62.458 g. (2) 75 ml of a well–mixed sample was taken in the crucible. (3) The crucible with the sample was dried to a constant mass of 65.020 g in a drying oven at 104 °C. (4) The crucible with the dried sample was placed in a muffle furnace at 600 °C for an hour. After cooling, the mass of the crucible with residues was 63:145 g.
The concentration of organic fraction of solids present in the return sludge sample is

A. 8800 mg/I
B. 25000 mg/I
C. 33800 mg/I
D. 426500 mg/I

51. A family of 7 people generates solid waste (SW) at the rate of 0.5 kg/capita/day and the bulk density of refuse in a typical garbage can is about 160 kg/m^3. If the collection is done once in a three weeks, the number of 170 litres can require for household is
A. 5 B. 4
C. 3 D. 2

52. A water sample has a pH of 9.25. The concentration of hydroxyl ions in the water sample is
A. $10^{-9.25}$ moles/L
B. $10^{-4.55}$ moles/L
C. 0.302 mg/L
D. 3.020 mg/L

53. Most of the turbidity meters work on the scattering principle. The turbidity value so obtained expressed in
A. CFU B. NTU
C. JTU D. NOT

54. Total Kjeldahl nitrogen is a measure of
A. Total organic nitrogen
B. Total organic and ammonia nitrogen
C. Total ammonia nitrogen
D. Total inorganic and ammonia nitrogen

55. Match the following:
Group–I (Characteristics of Industrial effluents discharged Into inland waters)
P. BOD_5
Q. COD
R. Oil and Grease
S. Total Suspended Solid
Group II ((Allowable limit, mg/I))
1. 250
2. 30
3. 20
4. 10
5. 100
6. 3
Codes :
P Q R S: ?
A. 2 5 4 2
B. 4 1 6 4
C. 2 1 4 5
D. 2 1 6 3

56. Which one of the following statement is correct?
A. Lower the F/M ratio, greater will be the removal of BOD.
B. Lower the F/M ratio, lower will be the removal of BOD.
C. F/M ratio is not related to the removal of BOD.
D. None of these

57. Match Group I (Terminology) with Group II (Definition/Brief Description) for wastewater treatment systems

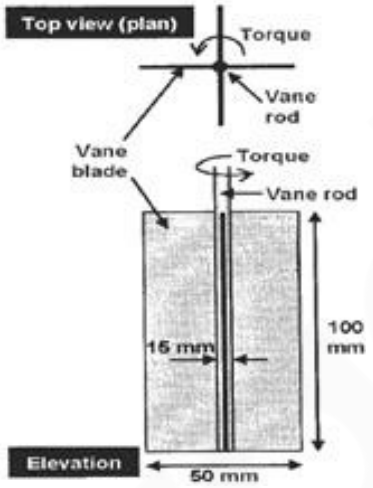
Group I		Group II	
P	Primary	1	Contaminant removal treatment By physical forces
Q	Secondary	2	Involving biological and/or treatment chemical reaction
R	Unit operation	3	Conversion of soluble Organic matter to biomass
S	Unit process	4	Removal of solid materials From incoming wastewater

A. P–4, Q–3, R–1, S–2
B. P–4, Q–3, R–2, S–1
C. P–3, Q–4, R–2, S–1
D. P–1, Q–2, R–3, S–4

58. The results of analysis of a raw water sample are given below
Turbidity : 5 mg/I
pH : 7.4
Fluorides : 2.5 mg/I
Total Hardness : 300 mg/I
Iron : 3.0 mg/I
MPN : 50 per 100 ml
From the data given above, it can be inferred that water needs removal of
A. Turbidity followed by disinfection
B. Fluorides and Hardness
C. Iron, followed by disinfection
D. Both B. and C.

59. The following data are given for the laboratory sample.
$\sigma_0' = 175\ kPa; e_0 = 1.1; \sigma_0' + \Delta\sigma_0' = 300\ kPa; e = 0.9$
If thickness of the clay specimen is 25 mm, the value of coefficient of volume compressibility is _____ $\times 10^{-4}$ m^2/kN
A. 3 B. 5
C. 12 D. 7.61

60. A field vane shear testing instrument (shown alongside) was inserted completely into a deposit of soft, saturated silty clay with the vane rod vertical such that the top of the blades were 500 mm below the ground surface. Upon application of a rapidly increasing torque about the vane rod, the soil was found to fail when the torque reached 4.6 Nm. Assuming mobilization of undrained shear strength on all failure surfaces to be uniform and the resistance mobilized on the surface of the vane rod to be negligible, what would be the peak undrained shear strength (rounded off to the nearest integer value of kPa) of the soil?



A. 5 kPa B. 10 kPa
C. 15 kPa D. 20 kPa

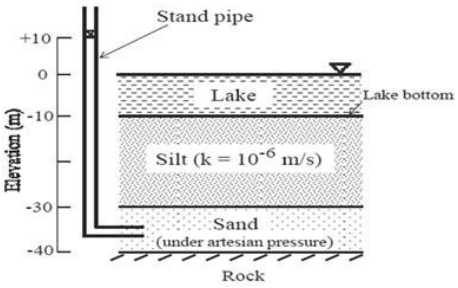
61. A sampling tube has an inner diameter of 80 mm and outer diameter of 88 mm. The area ratio is
A. 0.21 B. 0.12
C. - 0.21 D. - 0.12

62. A soil mass contains 40% gravel, 50% sand and 10% silt. This soil can be classified as
A. silty sandy gravel having coefficient of uniformity less that 60
B. silty gravelly sand having coefficient of uniformity equal to 10.
C. silty gravelly sand having coefficient of uniformity greater than 60.
D. gravelly silty sand and its coefficient of uniformity cannot be determined.

63. A soil has liquid limit of 35, plastic limit of 20 and moisture content 25%. What will be its liquidity index and plasticity index
A. 67, 15 B. 0.33, 15
C. 0.67, 25 D. 0.33, 20

64. A clay soil sample is tested in tri-axial apparatus in consolidated drained conditions at a cell pressure of 100KN/m2' What will be the pore water pressure at a deviator stress of 40KN/m^2
A. 60 KN/m^2 B. 20KN/m^2
C. 40KN/m^2 D. 0 KN/m^2

65. The soil profile below a lake with water level at elevation = 0 m and lake bottom at elevation = −10 m is shown in the figure, where k is the permeability coefficient. A piezometer (stand pipe) installed in the sand layer shows a reading of +10 m elevation. Assume that the piezometric head is uniform in the sand layer. The quantity of water (in m^3/s) flowing into the lake from the sand layer through the silt layer per unit area of the lake bed is:



A. 1.5 × 10^{-6} B. 2.0 × 10^{-6}
C. 0.5 × 10^{-6} D. 1 × 10^{-6}

66. A fine grained soil has liquid limit of 60 and plastic limit of 20. As per the plasticity chart, according is IS classification, the soil is represented by the letter symbols
A. CL B. CI
C. CH D. CH–ML

67. A direct shear test was conducted on a cohesionless soil (c = 0) specimen under a normal stress of 200 kN/m^2. The specimen failed at a shear stress of 100 kN/m^2. The angle of internal friction of the soil (degrees) is (round off to 1st decimal place)
A. 26.6 B. 29.5
C. 30.0 D. 32.6

68. The ratio of saturated unit weight to dry unit weight of a soil is 1.25. If the specific gravity of solids (G_g) is 2.56, the void ratio of the soil is
A. 0.640 B. 0.663
C. 0.944 D. 1.325

69. During the subsurface investigations for design of foundations, a standard penetration test was conducted at 4.5m below the ground surface. The record of number of blows is given below.

Penetration depth (cm)	No. of blows
0 – 7.5	3
7.5 – 15	3
15 – 22.5	6
22.5 – 30	6
30 – 37.5	8
37.5 – 45	7

Assuming the water table at ground level, soil as fine sand and correction factor for overburden as 1.0, the corrected 'N' value for the soil would be
A. 18 B. 19
C. 21 D. 33

70. List I and List II contains respectively terms and expressions related to soil classification. Match the two lists and select the correct answer using the codes given below the lists:

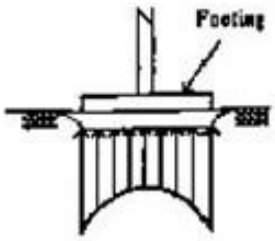
List-I
A) Activity number
B) Liquidity index
C) Sensitivity index
D) Consistency index

List-II
1. $\frac{\text{Liquid limit - water content}}{\text{Plasticity index}}$
2. $\frac{\text{Plasticity index}}{\text{Percent finer than } 2\mu}$
3. $\frac{\text{Natural water content-plastic limit}}{\text{Plasticity index}}$
4. $\frac{\text{unconfined compressive strength of undisturb sample}}{\text{Unconfined compressive strength of remoulded soil sample}}$

A. A-1 B-3 C-4 D-2
B. A-1 B-2 C-3 D-4
C. A-3 B-2 C-1 D-4
D. A-2 B-3 C-4 D-1

71. A non–homogenous soil deposit consists of a silt layer sandwiched between a fine–sand layer at top and a clay layer below. Permeability of the silt layer is 10 times the permeability of the clay layer and one–tenth of the permeability of the sand layer. Thickness of the silt layer is 2 times the thickness of the sand layer and two–third of the thickness of the clay layer. The ratio of equivalent horizontal and equivalent vertical permeability of the deposit is _____. (upto 2 decimal places)
A. 10.97 B. 10.98
C. 10.99 D. None

72. The figure given below represents the contact pressure distribution underneath a



A. rigid footing on saturated clay
B. rigid footing on sand
C. flexible footing on saturated clay
D. flexible footing on sand

73. Two footings, one square and the other continuous are founded on the surface of a pure cohesionless soil. The side of the square footing is equal to the width of the continuous footing, then the ratio of their ultimate bearing capacities is
A. 0.80 B. 0.62
C. 0.54 D. 0.32

74. For a 25cm thick cement concrete pavement, analysis of stresses gives the following values

Wheel load stress due to corner loading	30kg/cm2
Wheel load stress due to edge loading	32kg/cm2
Warping stress at corner region during summer	9 kg/cm2
Warping stress at corner region during winter	7 kg/cm2
Warping stress at edge region during summer	8 kg/cm2
Warping stress at edge region during winter	6 kg/cm2
Frictional Stress during summer	5 kg/cm2
Frictional Stress during winter	4 kg/cm2

The most critical stress value for this pavement is
A. 40 kg/cm^2 B. 42 kg/cm^2
C. 44 kg/cm^2 D. 45 kg/cm^2

75. A crest vertical cruve joins two gradients of +3% and –2% for a design speed of 80 km/h and the corresponding stopping sight distance of 120m. The height of driver's eye and the object above the road surface are 1.20 m and 0.15 m respectively. The curve length to be provided is
A. 120 m B. 152 m
C. 164 m D. 240 m

76. A vehicle moving at 60 kmph on an ascending gradient of a highway has to come to stop position to avoid collision with a stationary object. The ratio of lag to brake distance is 6:5. Considering total reaction time of the driver as 2.5 seconds and the coefficient of longitudinal friction as 0.36, the value of ascending gradient (%) is
A. 3.3 B. 4.8
C. 5.3 D. 6.8

77. The following observations were made of an axle-load survey on a road

Axle Load (kN)	Repetitions per day
35-45	800
75-85	400

The standard axle load is 80kN. Equivalent daily number of repetitions for the standard axle - load are
A. 450 B. 480
C. 800 D. 1200

78. The speed–density (u–k) relationship on a single lane road with unidirectional flow is u = 70 – 0.7 k, where u is in km/hr and k is in veh/km. The capacity of the road (in veh/hr) is _____
A. 1250 B. 1500
C. 1750 D. 1420

79. In signal design as per Indian Roads Congress specifications, if the sum of the ratios of normal flows to saturation flow of two directional traffic flow is 0.50 and the total lost time per cycle is 10 seconds, the optimum cycle length in seconds is
A. 100 B. 80
C. 60 D. 40

80. Consider the following statements in the context of cement concrete pavements.
I: Warping stresses in cement concrete pavements are caused by the seasonal variation in temperature
II: Tie bars are generally provided across transverse joints of cement concrete pavements
The correct option evaluating the above statement is
A. I : True II : False
B. I : False II : True
C. I : True II : True
D. I : False II : False

81. The monthly mean temperature of maximum daily temperature and monthly mean of average daily temperature of the hottest month of year are 52 degree Celsius and 40 degree Celsius respectively. Then airport reference temperature is?
A. 44 B. 70
C. 38 D. 56

82. The sleeper density for a broad gauge track if 19 sleepers are used under a rail length. Given that length of a rail for B.G. track is 12.8 metres.
A. n+7 B. n+5
C. n+4 D. n+6

83. For steady flow to a fully penetrating well in a confined aquifer, the drawdowns at radial distances of r_1 and r_2 from the well have been measured as s_1, and $s_2$respectively, for a pumping rate of Q. The Transmissivity of the aquifer is equal to

A. $\frac{Q}{2\pi}\frac{\ln\frac{r_2}{r_1}}{(s_1-s_2)}$

B. $\frac{Q}{2\pi}\frac{\ln(r_2-r_1)}{(s_1-s_2)}$

C. $\frac{Q}{2\pi}\ln\left(\frac{r_2/r_1}{s_1/s_2}\right)$

D. $2\pi Q\frac{r_2-r_1}{\ln\left(\frac{s_2}{s_1}\right)}$

84. The depth of flow in an alluvial channel is 1.5 m. If critical velocity ratio is 1.1 and Manning's *n* is 0.018, the critical velocity of the channel as per Kennedy's method is
A. 0.713 m/s B. 0.784 m/s
C. 0.879 m/s D. 1.108 m/s

85. The average rainfall for a 3 hour duration storm is 2.7 cm and the loss rate is 0.3 cm/hr. The flood hydrograph has a base flow of 20 m^3/s and produces a peak flow of 210 m^3/s. The peak of a 3–h unit hydrograph is
A. 125.50 m^3/s B. 105.50 m^3/s
C. 77.77 m^3/s D. 70.37 m^3/s

86. A flood wave with a known inflow hydrograph is routed through a large reservoir. The outflow hydrograph will have
A. attenuated peak with reduce time–base
B. attenuated peak with increased time–base
C. increased peak with increased time–base
D. increased peak with reduce time–base

87. The magnetic bearing of a line AB is S 45° E and the declination is 5° west. The true bearing of the line AB is
A. S 45° E B. S 40° E
C. S 50° E D. S 50° W

88. A leveling is carried out to establish the Reduced Levels (RL) of point R with respect to the Bench Mark (BM) at P. The staff readings taken are given below:

Staff Station	BS	IS	FS	RL
P	1.655 m			100.000m
Q	0.950 m		1.500m	
R			0.750m	?

If RL of P is + 100.000m, then RL (in m) of R is
A. 103.355 B. 103.155
C. 101.455 D. 100.355

89. Group I lists tool/instrument while Group II lists the method of surveying. Match the tool/instrument with the corresponding method of surveying.
Group–I
P. Alidade
Q. Arrow
R. Bubble tube
S. Stadia hair
Group–II
1. Chain surveying
2. Levelling
3. Plain table surveying
4. Theodilite surveying
A. P–3; Q–2; R–1; S–4
B. P–2; Q–4; R–3; S–1
C. P–1; Q–2; R–4; S–3
D. P–3; Q–1; R–2; S–4

90. Match the following:

Group–I

P Rainfall intensity
Q Rainfall excess
R Rainfall averaging
S Mass curve

Group–II

1. Isohyets
2. Cumulative rainfall
3. Hyetograph
4. Direct runoff hydrograph

Codes :

P Q R S

A. 1 3 2 4
B. 3 4 1 2
C. 1 2 4 3
D. 3 4 2 1

91. The two columns below show some parameters and their possible values.

Parameter

P – Gross CommandArea
Q – Permanent WiltingPoint
R – Duty of canal water
S – Delta of wheat

Value

I – 100 hectares/cumec
II – 6 °C
III – 1000 hectares
IV – 1000 cm
V – 40 cm
VI – 0.12 Which of the following options matches the parameters and the values correctly?

A. P–I, Q–II, R–III, S–IV
B. P–III, Q–VI, R–I, S–V
C. P–I, Q–V, R–VI, S–II
D. P–III, Q–II, R–V, S–IV

92. In a sub surface drainage system, circular tile drains flowing half full are laid with a slope of 0.28% to carry a peak discharge of 3 l/s per drain. If Manning's constant (n) is 0.011, then the practical hydraulic radius of tile drain (in mm) required is

A. 97.265
B. 48.63
C. 24.32
D. 64.84

93. The two Eigen values of the matrix $\begin{bmatrix} 2 & 1 \\ 1 & p \end{bmatrix}$ have a ratio of 3: 1 for p = 2. What is another value of p for which the Eigen values have the same ratio of 3: 1?

A. -2 B. 1
C. 7/3 D. 14/3

94. The Fourier series of the function,

$f(x) = -\pi < x \le 0$

$= \pi - x,\ 0 < x < \pi$

in the interval [−π, π] is

$f(x) = \frac{\pi}{4} + \frac{2}{\pi}\left[\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \ldots.\right] + \left[\frac{\sin x}{1} + \frac{\sin 2x}{2} + \frac{\sin 3x}{3} + \ldots\right]$

The convergence of the above Fourier series at x = 0 gives

A. $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$

B. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12}$

C. $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$

D. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n-1} = \frac{\pi^2}{4}$

95. If $\int_1^2 \int_0^x \frac{1}{(x^2+y^2)^{3/2}}\, dy\, dx$ transforms to $\int_0^a \int_b^c \frac{1}{r^2}\, dr\, d\theta$ in polar coordinates r and θ, then a, b, c respectively, are

A. $\frac{\pi}{4}, \sec\theta \text{ and } 2\sec\theta$

B. $\frac{\pi}{4}, 2\sec\theta \text{ and } 4\sec\theta$

C. $\frac{\pi}{2}, 2\sec\theta \text{ and } 4\sec\theta$

D. $\frac{\pi}{2}, \sec\theta \text{ and } 2\sec\theta$

96. Let $F(x) = f(x) + f\left(\frac{1}{x}\right)$, where $f(x) = \int_1^x \frac{\log t}{1+t} dt$, then F(e) equals
A. 1 B. 2
C. 1/2 D. 0

97. The value of the function is
$$f(x) = \lim_{x\to\infty}(x)^{\frac{a}{x}}$$
A. 0 B. 1
C. ∞ D. e^a

98. The solution of the differential equation $ydx = -(x^2y + x)\,dy$ is
A. $\frac{1}{xy} + \log y = C$
B. $-\frac{1}{xy} + \log y = C$
C. $-\frac{1}{xy} = C$
D. $\log y = Cx$

99. Matrix B = $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$ has a eigen vectors as $\begin{bmatrix} 50 \\ 50 \end{bmatrix}$. Find the corresponding eigen values for the given eigen vectors.
A. 1 B. 3
C. -3 D. -1

100. For the function $f(x) = x^2 e^{-x}$, the maximum occurs when x is equal to _____.
A. 2 B. 3
C. 4 D. 6

ANSWER KEY

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

***

gradeup

BARC Civil 2019
Online Test Series

1. Based on the Latest Exam Pattern
2. All India Rank & Performance Analysis
3. Detailed Explanation of Solutions
4. Available on Mobile & Desktop

www.gradeup.co