

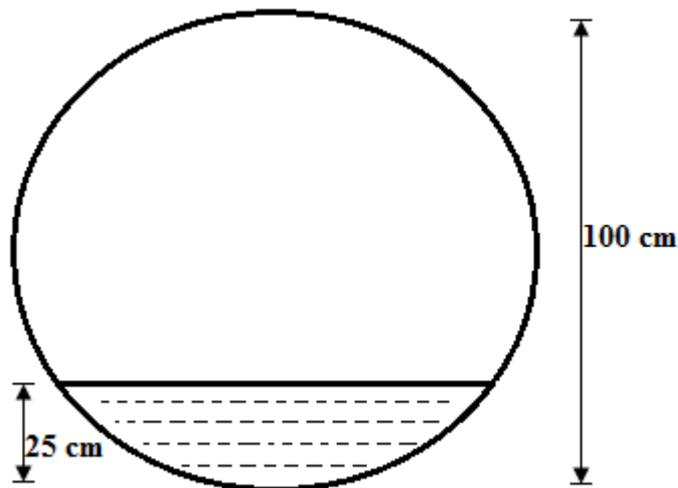
MOCK – 3

GATE-2015 (CIVIL ENGINEERING)

- This Mock Test Paper consists of 65 questions carrying 100 marks.
- Kindly attempt this paper in 3 hours.
- Questions Q.1 – Q.25 carry 1 mark each. Questions Q.26 – Q.55 carry 2 marks each.
- Questions Q.56 – Q.65 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 – Q.60 carry 1 mark each, and questions Q.61 – Q.65 carry 2 marks each.
- Unattempted questions will result in zero mark and wrong answers will result in **NEGATIVE** marks. For all 1 mark questions, 1/3 mark will be deducted for each wrong answer. For all 2 marks questions, 2/3 mark will be deducted for each wrong answer.
- Answers and Solutions of the test have been provided in separate documents which can also be downloaded from www.egyanbodh.wix.com/gyanbodh.
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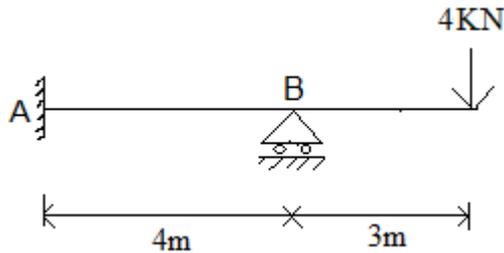
1. As per IS 1498-1970, uniformity coefficient (C_u) for a well graded sand (SW) is greater than
 - a) 3
 - b) 4

- c) 5
d) 6
2. The directional derivative of $f(x,y,z) = 2x^2+3y^2+z^2$ at P (2,1,3) in the direction of $a = [1,0,-2]$ is _____ (upto 3 decimal places)
3. Which of the following statements is/are correct:
- 1) Cylinder strength of concrete is less than the cube strength because of the difference in the shape of the cross section of the specimens.
 - 2) According to Darcy's law for flow through porous media, the velocity is proportional to effective stress.
- a) Only 1
b) Only 2
c) Both 1 & 2
d) None
4. The wetted perimeter in metres for the flow in sewer pipe as shown in fig. is

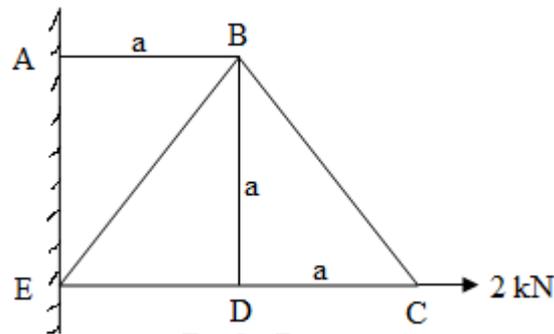


- a) $\pi/2$
b) $\pi/3$
c) $2\pi/3$
d) $3\pi/2$

5. The magnitude of the BM at the support A for the beam given below is

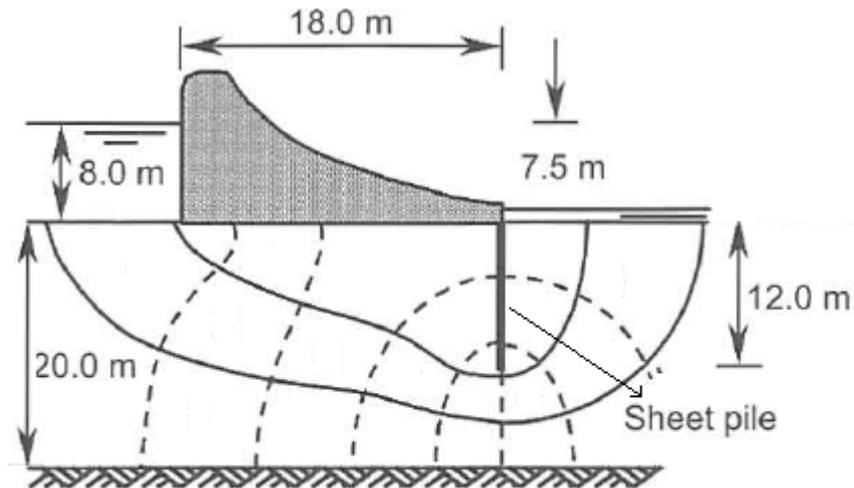


- a) 6 kNm
b) 12 kNm
c) 16 kNm
d) 28 kNm
6. In the structure shown below, which of the members carry zero forces



- 1) BC 2) BD 3) AB
a) Only 2
b) Only 1 & 2
c) Only 2 & 3
d) All 1, 2 & 3

7. The given figure shows the flow net under a concrete dam which retains 8 m of water as shown below.

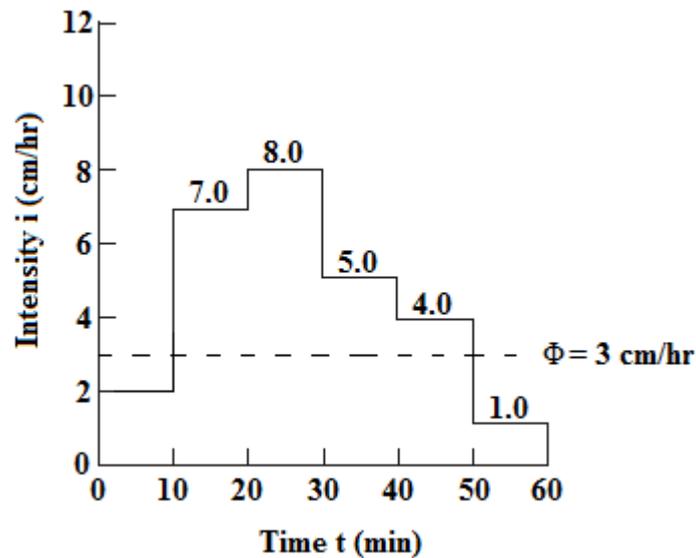


The flow rate in m^3/day per metre length (upto 2 decimal places) is _____
(Take $k = 5 \times 10^{-5} \text{ m/s}$)

8. For flow through a 90° V-notch weir, an error of 20% occurred in the head measurement. The percentage error introduced in discharge over weir is
- 20%
 - 30%
 - 40%
 - 50%
9. If the loading on a prestressed rectangular beam is uniformly distributed, the tendon to be provided should be
- straight below centroidal axis
 - parabolic with convexity upward
 - parabolic with convexity downward
 - straight above centroidal axis
10. As per IS 4111:1986, a sewer manhole is considered to be deep if its depth is greater than
- 1.50 m
 - 1.60 m
 - 1.65 m

d) 1.85 m

11. The rates of rainfall for the successive 10 minute period of a 1-hour storm is given below:



If the value of ϕ -index is 3 cm/hr, the run off will be

- a) 1 cm
- b) 2 cm
- c) 2.6 cm
- d) 3 cm

12. If A, B and C are square matrices, consider the following:

- 1) $AB = 0$ implies that $A = 0$ and $B = 0$
- 2) $AB = AC$ implies that $B = C$

Which of the above is true

- a) Only 1
- b) Only 2
- c) Both 1 & 2
- d) None

13. The line of collimation method of reduction of levels does not provide a check on

- a) Intermediate sights
- b) fore sights
- c) back sights

- d) reduced levels
14. According to IS 456:2000, the water used for concrete mixing or curing must not have pH value less than
- a) 7
 - b) 6
 - c) 5.5
 - d) 5
15. If the flexural rigidity of a column whose length is L and the loaded end is free (other end fixed), is EI , Euler's critical buckling load will be
- a) $P_C = \pi^2 EI / (3L^2)$
 - b) $P_C = \pi^2 EI / (4L^2)$
 - c) $P_C = \pi^2 EI / L^2$
 - d) $P_C = \pi^2 EI / (2L^2)$
16. The table below shows 15-minute volume counts during the peak hour on an approach of an intersection.

Time	Volume
09:00 – 09:15 AM	325
09:15 – 09:30 AM	350
09:30 – 09:45 AM	330
09:45 – 10:00 AM	340

The Peak-Hour Factor (PHF) upto two decimal places is _____.

17. A dam spillway is to be tested using Froude scaling with a $1:t$ model. If Q is the flow of the model, then the flow of prototype is
- a) $t^{5/2} Q$
 - b) $t^{3/2} Q$
 - c) $t^{1/2} Q$
 - d) $t Q$
18. A continuous beam shall be deemed to be a deep beam as per IS 456:2000, when the ratio of effective span to overall depth i.e. L / D is less than
- a) 2
 - b) 2.5

- c) 3
d) None of these
19. The percentage chance that a 25 year storm may not occur in another 15 years is _____(upto one decimal place).
20. Disinfection of drinking water is done to remove
- Bacterias
 - odour
 - Both a and b
 - None
21. Degree of the differential equation $d^2y/dx^2 = 1 + \sqrt{dy/dx}$ is _____.
22. For same area, slope and manning's factor n, which section out of semicircular, rectangular and trapezoidal section will discharge more water
- Semicircular
 - Rectangular
 - Trapezoidal
 - All will discharge same amount
23. A tapered bar AB of solid circular cross section is twisted by torques 300 Nm applied at the ends. The diameter of the bar varies linearly from 30 mm at the lefthand end to 50 mm at the right-hand end. The maximum shear stress in the bar is
- 56.6 MPa
 - 23.9MPa
 - 12.2 MPa
 - None of these
24. The upstream face of the earth dam is considered as
- streak line
 - stream line
 - equipotential line
 - path line
25. Along horizontal curves, if centrifugal force exceeds lateral friction, vehicles may
- skid
 - slip

- c) Both a and b
d) none of these

26. If A and B are two square matrices, consider the following:

- 1) Rank (AB) = Rank ($A^T B^T$)
2) Rank A = Rank B implies that Rank (A^2) = Rank (B^2)

Which of the above is true

- a) Only 1
b) Only 2
c) Both 1 & 2
d) None

27. Ten plates of steel were examined for surface flaws. The frequency of the number of plates with a given number of flaws per plate was as follows:

No. of Flaws	0	1	2	3	4
Frequency	1	2	2	3	2

Assuming the number of flaws follows a Poisson distribution, the probability of finding a plate chosen at random which contains 2 or more surface flaws is _____ (upto 2 decimal places)

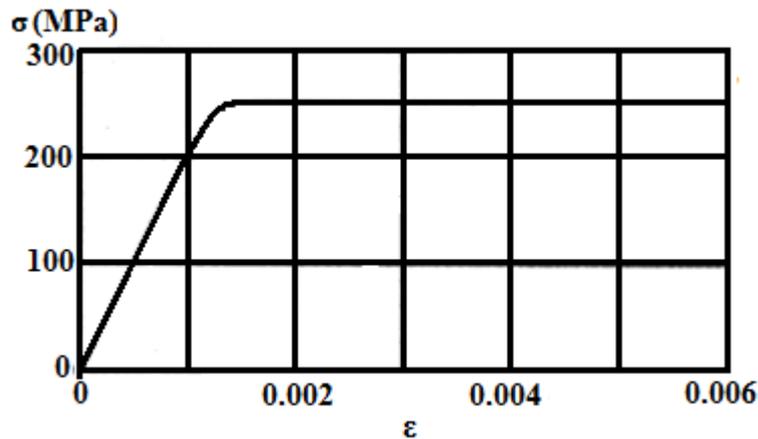
28. A population grows at the rate of 5% per year. Time required for it to become double is _____.

29. The integral $\int_0^{1.5} [x^2] dx$, where [] denotes the greatest integer function, equals _____.

30. The point on the curve $y^2 + x^2 = 4y$ where the tangent is vertical, is

- a) (0,0)
b) (± 2 , 2)
c) (± 2 , -2)
d) No such point exists

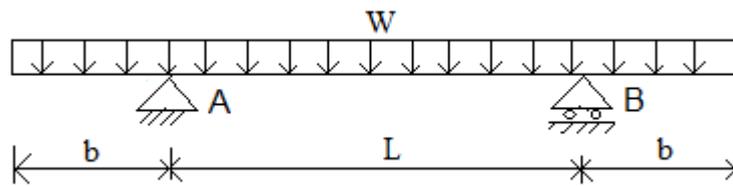
31. A bar of length 2.0 m is made of a structural steel having the stress-strain diagram shown in the figure. The yield stress of the steel is 250 MPa and the slope of the initial linear part of the stress-strain curve (modulus of elasticity) is 200 GPa. The bar is loaded axially until it elongates 6.5 mm, and then the load is removed. The difference in the final length of the bar compare with its original length is



- a) 1 mm
b) 2 mm
c) 3 mm
d) 4 mm
32. The ultimate moment of resistance of the following T-beam: $b_f = 450$ mm, $D_f = 150$ mm, $b_w = 300$ mm, $d = 440$ mm, $A_{st} = 2100$ mm² is _____. Assume $f_y = 415$ N/mm² and $f_{ck} = 25$ N/mm²
- a) 275 kNm
b) 350 kNm
c) 450 kNm
d) 500 kNm
33. If the specific gravity of a soil particle of 0.005 cm diameter is 2.67, its terminal velocity while settling in distilled water of viscosity 0.01 poise is
- a) 0.2200 cm/s
b) 0.2225 cm/s
c) 0.2250 cm/s
d) 0.2275 cm/s

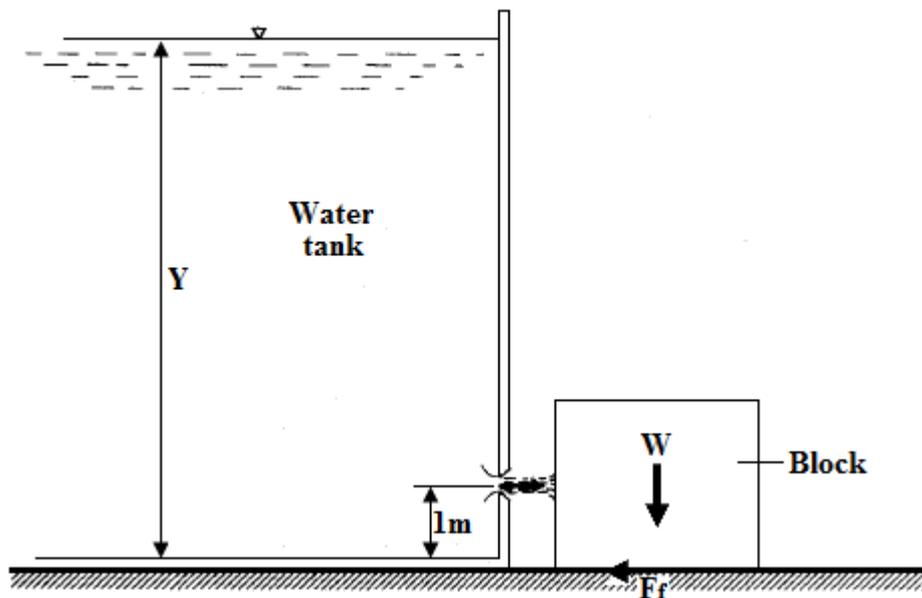
34. A 30-cm well penetrates an unconfined aquifer of saturated thickness 30 m completely. Under a steady pumping rate for a long time the drawdowns at two observation wells 20 m and 40 m from the well are 5.0 and 4.2 m respectively. If the permeability of the acquirer is 20 m/day, the discharge in Litre/minute (lpm) will be _____.

35. The given beam carries a uniform load of intensity W . The value of 'b' for which the maximum bending moment is equal to the maximum negative bending moment is



- a) 0.25 L
 - b) 0.35 L
 - c) 0.50 L
 - d) 0.70 L
36. A trapezoidal channel with a base of 6 m and side slopes of 2 horizontals to 1 vertical conveys water at $17 \text{ m}^3/\text{s}$ with a depth of 1.5 m. The flow is
- a) Sub critical
 - b) Critical
 - c) Super critical
 - d) Can not be determined
37. The mass specific gravity of a fully saturated specimen of clay having a water content of 40% is 1.8. On oven drying, the mass specific gravity drops to 1.6. The approximate shrinkage limit of the clay is
- a) 18%
 - b) 20%
 - c) 23%
 - d) 25%

38. A normally consolidated clay layer settled by 20 mm, when the effective stress was increased from 25 to 50 kN/m². Its total settlement due to increase in stress when the effective stress is further increased from 50 to 100 kN/m² is
- 20 mm
 - 30 mm
 - 40 mm
 - 50 mm
39. Water flows from a large tank through an orifice of 50 mm diameter and against a block, as shown in Fig.

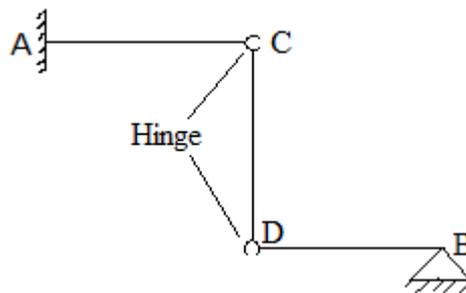


The water jet strikes the block at the vena contracta. The block weighs 750 N, and the coefficient of the friction between block and floor is 0.24. The orifice's coefficient of discharge (C) is 0.60, and its coefficient of contraction (C_c) is 0.62. The minimum height to which water must rise in the tank (y in Fig.) in order to start the block moving to the right is

- 8 m
- 9 m
- 10 m
- 11 m

40. The actual velocity in the contracted section of a jet of liquid flowing from a 50mm diameter orifice is 10.0 m/s under a head of 6 m. If the measured discharge is $0.012 \text{ m}^3/\text{s}$, the coefficient of contraction is
- 0.92
 - 0.56
 - 0.61
 - 0.74

41. The degree of indeterminacy of the given structure ACDB is



- zero
 - 2
 - 4
 - 6
42. For a culturable command area of 1000 hectare with intensity of irrigation of 50%, the duty on field for a certain crop is 2000 hectare/cumec. What is the discharge required at head of water course with 25% losses of water?
- $3/16$ cumec
 - $1/4$ cumec
 - $1/3$ cumec
 - $1/2$ cumec
43. A motorist traveling at 89 km/h down a grade of 5% on a highway observes a crash ahead of him, involving an overturned truck that is completely blocking the road. If the motorist was able to stop his vehicle 9 m from the overturned truck, his distance (in metres) from the truck when he first observed the crash was _____ (upto 2 decimal places). Assume perception reaction time = 2.5 sec, $f = 0.35$.

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An Enlightening Path of Knowledge

44. A closed traverse ABCDA was run around an area and the following observations were made:

Station		Included angle
From	To	
A	B	84°27'18''
B	C	78°54'24''
C	D	97°39'26''
D	A	98°59'12''

If the WCB of AB is 135°21'40'', the WCB of DA is _____

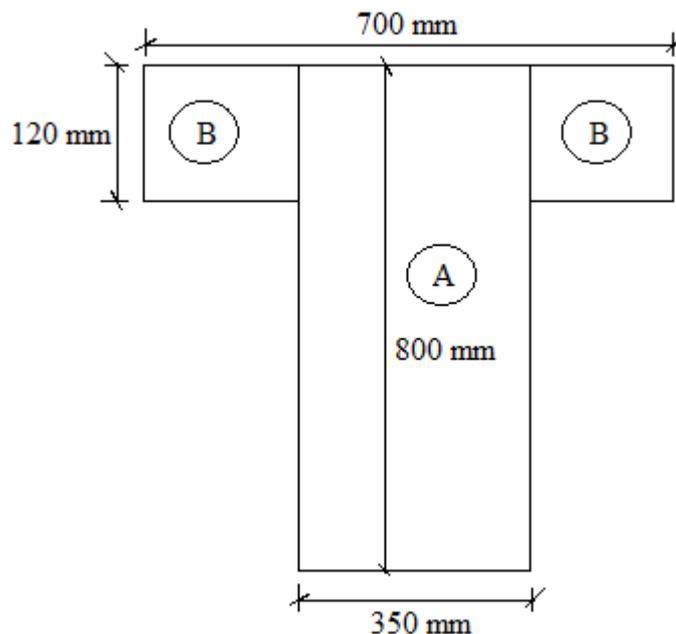
- a) 34°15'59''
 b) 129°05'33''
 c) 214°15'59''
 d) 230°54'27''
45. A rectangular channel 6.1 m wide carries 11.3 m³/s and discharges onto a 6.1 m wide apron with no slope at a mean velocity of 6.1 m/s. The height of the hydraulic jump in metres is _____ (upto 2 decimal places)
46. The flow ratios for a 4-phase signal system to be designed for a major intersection are: Phase A = 0.2, Phase B = 0.25, Phase C = 0.15 and Phase D = 0.2 . If the total lost time is 14 secs/cycle, the shortest cycle length that will avoid oversaturation is
- a) 32.5 sec
 b) 44.8 sec
 c) 56 sec
 d) 70 sec
47. Water has to be supplied to a town with 50,000 population at the rate of 135 litres per capita per day from a river, 2 km away. The difference in elevation between the lowest water level in the sump and service reservoir is 30 metres. If the diameter of the main is 50 cm, the horse power of the pump required is _____ (upto 2 decimal places).

Assume maximum demand = 1.8 times of avg. demand; $\gamma_w = 10 \text{ kN/m}^3$

Efficiency of pump = 70% ; Pump works for 16 hours a day.

Use Manning's formula with $n = 0.012$

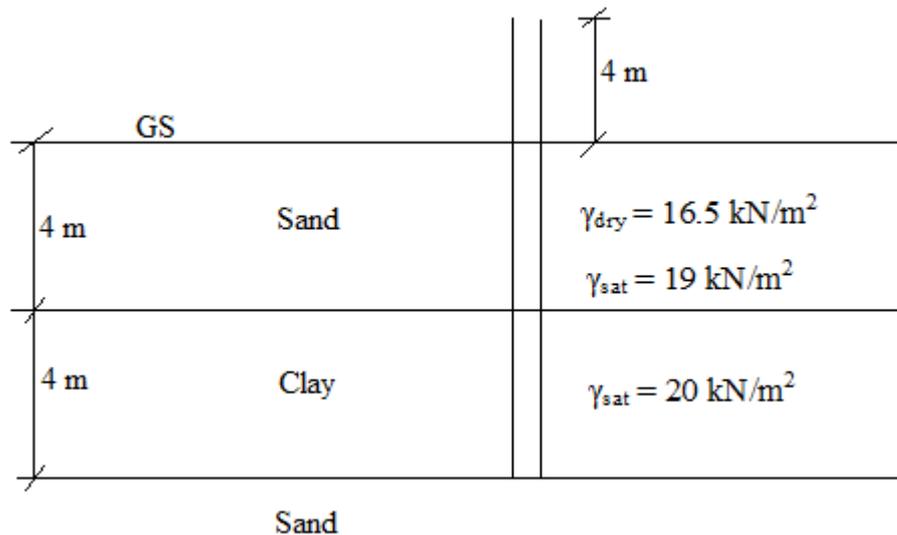
48. A loudspeaker produced a noise level of 50 dB lasting for 40 minutes and is followed by another loudspeaker which produced a noise level of 30 dB lasting for 20 minutes. The equivalent noise level is
- a) 40.91 dB
 - b) 43.33 dB
 - c) 46.62 dB
 - d) 48.26 dB
49. A pavement has a current average daily traffic count of 2000 vehicles. It is 10 years old and has a design life of 20 years. The historic growth rate was estimated at 4%. If the design traffic is 60 MSA (million standard axles), then the vehicle damage factor is _____ (upto 2 decimal places).
50. A T-beam is as shown below:



If the section is subjected to a torsion of 150 kNm, assuming the plastic theory, the approximate ratio of the torsion carried by rectangular portions A and B i.e. T_A / T_B is

- a) 7
- b) 29
- c) 57
- d) 73

51. A clay layer is overlain by a sand layer, the top of which is being the ground surface as shown in the figure. The water table is located 2 m below the ground surface. The clay layer is underlain by a sand stratum that is in artesian conditions with the water level in a standpipe being 4 m above the ground surface.



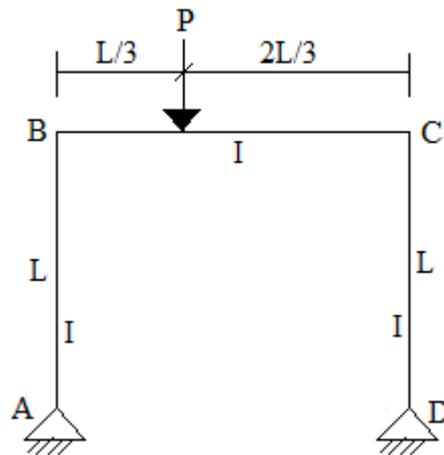
If the dry sand is excavated, then the depth at which the effective stress at the bottom of the clay layer will become zero is

- 1.56 m
 - 1.76 m
 - 1.88 m
 - 1.94 m
52. An activated sludge plant is used to treat domestic sewage of 5000 m³/day. If the Food to Micro-organisms ratio (F/M) of the system is 0.3, then the sludge age in days is _____.
- (Given: Influent BOD = 84 mg/L; Effluent BOD = 11.1 mg/L; MLSS = 2000 mg/L; Endogenous respiration rate constant, $K_e = 0.06 \text{ d}^{-1}$; Maximum yield coeff, $\alpha_y = 1$)
- 5 days
 - 5.5 days
 - 6 days
 - 6.5 days

53. For maximum discharge through a rectangular channel of width B and depth D , given cross-sectional area and slope, the hydraulic mean radius is

- a) $D/2$
- b) $B/4$
- c) Both a & b
- d) None

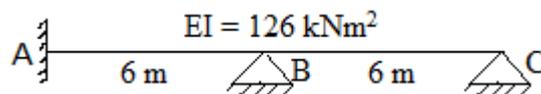
54. Consider the given frame pinned at A and D and loaded as shown below:



Which of the following is correct

- 1) Bending moment at B is equal to the bending moment at C .
 - 2) The value of bending moment at $B = PL/10$
- a) Only 1
 - b) Only 2
 - c) Both 1 & 2
 - d) None

55. The vertical reaction at support A for the given beam due to a vertical settlement of 20 mm at the support B is



- a) 90 N
- b) 110 N
- c) 170 N
- d) 230 N

56. Antonym : Prohibit

- a) Accept
- b) Permit
- c) Agree
- d) Grant

57. Find out which part of the sentence has an error

Man needs (a) / security and leisure (b) / of free thinking (c) / No error (d)

58. Fill in the blank with the most suitable word from given alternatives

He is working hard so that he _____ succeed.

- a) Shall
- b) Might
- c) Would
- d) Will

59. Choose the correct alternative such that the words on the right hand side of :: have the same relationship as the words on the left hand side of ::

Imprison : Jail :: Exile : ?

- a) Country
- b) Depart
- c) Banish
- d) Punishment

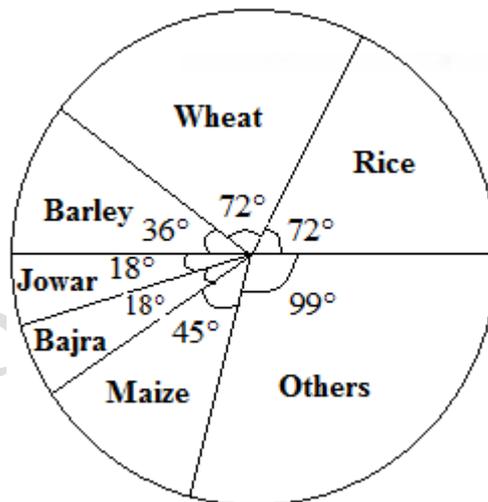
60. At the end of a business conference the ten people present all shake hands with each other once. How many handshakes will there be altogether?

- a) 20
- b) 45
- c) 55
- d) 90

61. When 15% is lost in grinding wheat, a country can export 30 lakh tonnes of wheat. On the other hand, if 10% is lost in grinding, it can export 40 lakh tonnes of wheat. The production of wheat (in lakh tonnes) in the country is

- a) 20
- b) 80

- c) 200
d) 800
62. How many seconds will a 500 m long train take to cross a man walking with a speed of 3 km/h in the direction of the moving train if the speed of the train is 63 km/h?
- a) 25
b) 30
c) 40
d) 45
63. A square and a rectangle have equal areas. If their perimeters are P_1 and P_2 respectively, then
- a) $P_1 < P_2$
b) $P_1 = P_2$
c) $P_1 > P_2$
d) None of these
64. The distribution of land under various crops is shown below:



If the production of wheat is 6 times that of barley, then the ratio between the yield per acre of wheat and barley is

- a) 3:2
b) 2:3
c) 12:1
d) 3:1

65. A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and the probability of wife's selection is $\frac{1}{5}$. The probability that only one of them is selected
- a) $\frac{1}{35}$
 - b) $\frac{10}{35}$
 - c) $\frac{11}{35}$
 - d) $\frac{12}{35}$