

1. The simply supported beam is subjected to a uniformly distributed load of intensity  $w$  per unit length on half of the span from one end. The length of the span and the flexural stiffness are denoted as  $L$  and  $EI$  respectively. The deflection at mid span of the beam is

- (a)  $\frac{5w L^4}{6144 EI}$  (b)  $\frac{5w L^4}{768 EI}$   
 (c)  $\frac{5w L^4}{384 EI}$  (d)  $\frac{5w L^4}{192 EI}$

2. Calculate the minimum sight distance required to avoid a head on collision of two cars approaching from the opposite directions at 90 and 60 kmph. Assume a reaction time of 2.5 seconds, coefficient of friction of 0.7 and a brake efficiency of 50%.

- (a) 236 m (b) 290 m  
 (c) 360 m (d) 180 m

3. For a circular curve of radius 200 m, the coefficient of lateral friction of 0.15 and the design speed is 40 kmph. Find the equilibrium super elevation (for equal pressure on inner and outer wheel)

- (a) 7.3% (b) 6.3%  
 (c) 9% (d) 5%

4. Based on 30<sup>th</sup> hour volume for how much % time during the year can the designer willingly tolerate the unfavourable operating condition?

- (a) 0.33% (b) 3.3%  
 (c) 33% (d) 0.03%

5. The effective stress friction angle of saturated cohesionless soil is 38 degree. The ratio of shear stress to normal effective stress on the failure plane is

- (a) 0.871 (b) 0.781  
 (c) 0.5 (d) 1

6. A layer of normally consolidated, saturated silty clay of 1 m thickness is subjected to one dimensional consolidation under a pressure increment of 20 kpa. The properties of the soil are specific gravity = 2.7, natural moisture content = 45%, compression index = .45, and recompression index = 0.05. The initial average effective stress within the layer is 100 kpa. Assuming Terzaghi's theory to be applicable, the primary consolidation settlement (rounded off to the nearest mm) is

- (a) 10 mm (b) 16 mm  
 (c) 160 mm (d) 1.6 mm

7. Determine the moment of resistance for the rectangular section of width = 250 mm and effective depth = 310 mm , area of tension reinforcement consist of 3-12  $\Phi$  bars . Use M 20 and Fe 500

- (a) 41 kN m            (b) 151 kNm  
(c) 81 kN m            (d) 101 kN m

8. A two dimensional flow is described by velocity component  $u = 2x$  and  $v = -2y$ . The discharge between points (1,1) and (2,2) is equal to

- (a) 6 unit            (b) 60 unit  
(c) 8 unit            (d) 80 unit

9. Find the critical depth for a discharge of 4 m<sup>3</sup>/sec for flow in right angled triangular channel

- (a) 1.027 m            (b) 1.15 m  
(c) 1.27 m            (d) 1.20 m

10. An incompressible fluid flows steadily through two pipes of diameter 0.15 m and 0.2 m which combined to discharge in a pipe of 0.3 m diameter . If the average velocity in the 0.15 m and 0.2 m diameter pipes are 2 m/s and 3 m/s respectively, then find the average velocity in the 0.3 m dia pipe

- (a) 1.90 m /sec            (b) 1.83 m/sec  
(c) 1.73 m/sec            (d) 1.53 m/sec

11. If the principal stresses in a two dimensional case are -10 MPa and 10 MPa respectively, then maximum shear stress at a point is

- (a) 20 MPa            (b) 10 MPa  
(c) 5 MPa            (d) zero

12. A steel column, pinned at both ends ,has a buckling load of 200 kN . If the column is restrained against lateral movement at its mid height, its buckling load will be

- (a) 200 kN            (b) 283 kN  
(c) 400 kN            (d) 800 kN

13. The flexural tensile strength of M 30 concrete as per IS 456 2000 is

- (a) 30 MPa            (b) 21.23 Mpa  
(c) 3.83 MPa            (d) 6 MPa

14. The shape of cross section having largest shape factor , is

- (a) Rectangular            (b) I section  
(c) solid circular            (d) diamond

15. A 6 m thick clay layer undergoes 90 % consolidation 4 times faster under two two way drainage as compared to one way drainage. In an identical clay layer of 12 m thickness, two way drainage will be faster as compared to one way drainage by

- (a) 8 times            (b) 4 times  
(c) 2 times            (d) 16 times

16. A water sample has a pH of 9.25 . The concentration of hydroxyl ions in the water sample is

- (a) 0.302 mg/L  
 (b)  $10^{-9.25}$  moles /L  
 (c)  $10^{-4.75}$  milli moles /L  
 (d) None

17. A circular primary clarifier processes an average flow of  $5005 \text{ m}^3 / d$  of municipal waste water. The overflow rate is  $35 \text{ m}^3 / \text{m}^2 / d$ . The diameter of clarifier shall be

- (a) 11.5 m                      (b) 12.5 m  
 (c) 13.5 m                      (d) 10.5 m

18. The magnetic bearing of a line AB is S 45 E and the declination is 5 degree 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

19. In a hand of Bridge, Probability that a person have 5 spades and his partner has remaining?

- (a)  $2.6083 \times 10^{-6}$               (b)  $2.7016 \times 10^{-5}$   
 (c)  $9.999 \times 10^{-6}$               (d)  $2.026 \times 10^{-9}$

20. A player losses 6 coin's then the probability that both the aces are the same Number.

- (a) 0.3125                      (b) 0.2343  
 (c) none of these              (d) does not exist

21. The values of a function  $f(x)$  are tabulated below :

x	0	1	2	3
f(x)	1	2	1	10

Using Newton's forward difference formula the cubic polynomial that can be fitted to the above data is

- (a)  $2x^3 + 7x^2 - 6x + 2$   
 (b)  $2x^3 - 7x^2 + 6x - 2$   
 (c)  $x^3 - 7x^2 - 6x^2 + 1$   
 (d)  $2x^3 - 7x^2 + 6x + 1$

22. The rank of the matrix :

$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$

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

23.  $f(x) = |x|$ , then in the interval  $[-1, 1]$   $f(x)$  is

- (a) Satisfied all the conditions of Rolle's Theorem  
 (b) Satisfied all the conditions of mean value theorem  
 (c) Does not satisfied the condition of man value theorem  
 (d) None of these

24. The Laplace transform of  $\sinh at$  is

(a)  $\frac{a}{s^2 - a^2}$

(b)  $\frac{s}{s^2 - a^2}$

(c)  $\frac{s}{s^2 + a^2}$

(d)  $\frac{a}{s^2 + a^2}$

25. The value of  $\frac{1}{D^2 + a^2} c \cos ax$  is

(a)  $\frac{x}{2a} \cos ax$

(b)  $\frac{-x}{2a} \sin ax$

(c)  $\frac{x}{2a} \sin ax$

(d) none of these

