

155/2015

Maximum : 100 marks

Time : 1 hour and 15 minutes

1. The maximum twisting moment a shaft can resist, is the product of the permissible shear stress and :
(A) Moment of inertia (B) Polar moment of inertia
(C) Polar modulus (D) Modulus of rigidity
2. A beam of length L is pinned at both ends and is subjected to a concentrated bending couple of moment M at its centre. The maximum bending moment in the beam is :
(A) $ML/2$ (B) M
(C) $M/3$ (D) $M/2$
3. In plastic analysis, the shape factor for a triangular section, is :
(A) 1.5 (B) 1.34
(C) 2.34 (D) 2.5
4. A single rolling load 8 kN rolls along a girder of 15 m span. The absolute maximum bending moment will be :
(A) 8 kN-m (B) 15 kN-m
(C) 30 kN-m (D) 60 kN-m
5. A rectangular beam 250 mm wide, 310 mm effective depth has 3 bars of 12 mm diameter HYSD grade Fe 415 steel bars. Concrete grade is M20. The ultimate moment of resistance of the beam is :
(A) 35 kN-m (B) 40 kN-m
(C) 45 kN-m (D) 55 kN-m
6. A cantilever steel beam of 3m span carries a udl of 10 kN/m inclusive of self weight. The beam comprises of ISMB200@198N/m. Web thickness = 5.4 mm, $I_{xx} = 1696.6 \text{ cm}^4$ and $I_{yy} = 115 \text{ cm}^4$. The maximum bending stress and average shear stresses in Mpa are respectively :
(A) 66.3 and 55 (B) 265 and 27.78
(C) 390.8 and 54 (D) 132.5 and 27.78

7. In case of principal axes of a section :
- (A) sum of moment of inertia is zero
 - (B) difference of moment inertia is zero
 - (C) product of moment of inertia is zero
 - (D) none of these
8. In case of a beam of rectangular cross section simply supported over a span L and loaded with a central load W , length of elasto-plastic zone of the plastic hinge is :
- (A) $L/2$
 - (B) $L/3$
 - (C) $L/4$
 - (D) $L/8$
9. The degree of static indeterminacy of a rigid-jointed space frame is :
- (A) $m + r - 2j$
 - (B) $m + r - 3j$
 - (C) $3m + r - 3j$
 - (D) $6m + r - 6j$
10. For stable structures, one of the important properties of flexibility and stiffness matrices is that the elements on the main diagonal
- (i) of a stiffness matrix must be positive
 - (ii) of a stiffness matrix must be negative
 - (iii) of a flexibility matrix must be positive
 - (iv) of a flexibility matrix must be negative
- The correct answer is :
- (A) (i) and (iii)
 - (B) (ii) and (iii)
 - (C) (i) and (iv)
 - (D) (ii) and (iv)
11. In SPT, the test uses a thick-walled sample tube, with an outside diameter :
- (A) 45 mm
 - (B) 53 mm
 - (C) 55 mm
 - (D) 50 mm
12. Unconfined compressive strength is given by 120 kN/m^2 , what will be the unconfined shear strength or cohesion?
- (A) 60 kN/m^2
 - (B) 80 kN/m^2
 - (C) 90 kN/m^2
 - (D) 120 kN/m^2
13. If a soil is fully saturated having void ratio 0.67 what will be the porosity?
- (A) 40%
 - (B) 42%
 - (C) 44%
 - (D) 46%