

1. A steel wire of 20 mm diameter is bent into a circular shape of 10 radius . If  $E$ , the modulus of elasticity is  $2 \times 10^6 \text{ kg / cm}^2$  then the maximum stress induced in the wire is

- $10^3 \text{ kg / cm}^2$
- $2 \times 10^3 \text{ kg / cm}^2$
- $4 \times 10^3 \text{ kg / cm}^2$
- $6 \times 10^3 \text{ kg / cm}^2$

2. Consider the following statements :

- If a beam has two axes of symmetry even then shear centre does not coincide with the centroid.
- For a section having one axis of symmetry, the shear centre does not coincide with the centroid but lies on the axis of symmetry
- If a load passes through the shear centre, then the will be only in the cross section and no twisting.

Which of these statements are correct ?

- 1, 2, and 3
- 1 and 3
- 2 and 3
- 1 and 3

3. Give that

$M = E_s / E_t =$  moment of inertia of timber portion and  $I_s =$  moment of inertia of steel portion , the equivalent moment of inertia of a flitched beam made of steel and timber is given by

- $L_t + I_s / m$
- $L_s + I_t / m$
- $L_s + I_t / m$
- $L_t + m I_s$

4. A ratio of moment carrying capacity of a circular beam of diameter  $D$  and square beam of size ' $D$ ' is

- $\frac{\pi}{4}$
- $\frac{3\pi}{8}$
- $\frac{\pi}{3}$
- $\frac{3\pi}{16}$

5. Assertion (A) : I section is preferred to rectangular section for resisting bending moment

Reason (R) : In – section more than 80% of bending moment is resisted by flanges only.

6. A simply supported beam of span 'L' carries a concentrated load 'W' at mid-span . If the width 'b' of the beam is constant and its depth is varying throughout the span, then what should be its mid-span depth, when design stress is 'f'

- $\frac{\sqrt{6WL}}{bf}$
- $\frac{6WL}{bf}$
- $\frac{\sqrt{3WL}}{2bf}$
- $\frac{3WL}{2bf}$

7. In a simply supported wooden beam under uniformly distributed load, a hole has to be made in the direction of width at midspan to provide a pipeline. Form structural strength point of view , it would be advisable to have the hole made at

- The bottom
- The top
- Mid depth
- 1 / 4 depth either from the top or the bottom

8. A cantilever of constant depth carries a uniformly distributed on the whole span. To make the maximum stress at all sections the same, the breadth of the section at a distance  $x$  from the free end should be proportional

- $X$
- $\sqrt{x}$
- $X^2$
- $X^3$

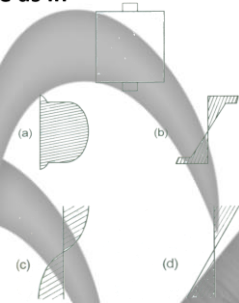
9. Match List I with List II and select correct answer using the codes given below the lists:

List I	List II
A. Moment of inertia	1. Tensile stress
B. Elongation	2. Modulus of rupture
C. Neutral axis	3. Zero shear stress
D. Top fibre	4. Zero longitudinal stress

Codes :

- A – 2, B – 1, C – 3, D – 4
- A – 1, B – 2, C – 4, D – 3
- A – 3, B – 4, C – 1, D – 2
- A – 2, B – 1, C – 4, D – 3

10. A flitched beam shown in the figure subjected to a bending moment, the strain variation across the cross section will be as in



11. The ratio of the flexural strengths of two beams of square cross section , the first beam being placed with its top and bottom sides horizontal and the second beam being placed with one diagonal horizontal, is

- $\sqrt{3}$
- $\frac{1}{\sqrt{3}}$
- $\frac{1}{\sqrt{2}}$
- $\sqrt{2}$

12. A simply supported beam of span 'l' carries a point load W at midspan. The breadth 'b' of the beam along the entire span is constant. Given , f = permissible stress in bending , for a beam of uniform strength , the depth of the beam at any cross section at a distance 'x' from the support would be

- $6Wx/fb$
- $\sqrt{6Wx/fb}$
- $3Wx/fb$
- $\sqrt{3Wx/fb}$

13. A rectangular timber beam is cut out of a cylindrical log of diameter 'D' the depth of the strongest timber beam will be

- $\sqrt{\frac{1}{2}} \cdot D$
- $\sqrt{\frac{2}{3}} \cdot D$
- $\sqrt{\frac{5}{8}} \cdot D$
- $\sqrt{\frac{3}{4}} \cdot D$

14. A high strength steel bead saw of 90 mm width and 0.5 mm thickness runs over a pulley of 500 mm diameter . Assuming  $E = 200 \text{ Gpa}$  , the maximum flexural stress developed would be

- a. 100 Mpa
- b. 200 Mpa
- c. 400 Mpa
- d. 500 Mpa

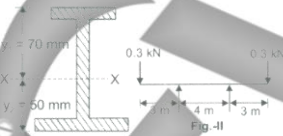
15. The simply supported beam of constant width and varying depth and uniform strength is subjected to a central concentrated load. The depth of the beam  $d_x$  from one of the supports is proportional to

- a.  $X^{1/2}$
- b.  $X^{1/3}$
- c.  $X$
- d.  $X^2$

16. A mild steel flat of width 120 mm and thickness 10 mm is bent into an arc of a circle of radius 10 m by applying a pure moment 'M' . If  $E$  is  $2 \times 10^5 \text{ N/mm}^2$  then the magnitude of the pure moment  $M$  will be

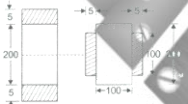
- a.  $2 \times 10^6 \text{ N-mm}$
- b.  $2 \times 10^5 \text{ N-mm}$
- c.  $0.2 \times 10^5 \text{ N-mm}$
- d.  $0.2 \times 10^4 \text{ N-mm}$

17. The cross section of a beam is shown in figure i. its  $I_{xx}$  equal to  $3 \times 10^6 \text{ mm}^4$  . It is subjected to a load as shown in figure ii. The maximum tensile stress in the beam would be



- a. Indeterminable as data is insufficient
- b.  $21 \text{ MN / m}^2$
- c.  $21 \text{ kN / m}^2$
- d.  $21 \text{ N / m}^2$

18. A timber beam of 100 mm width and 200 mm depth is reinforced with two steel plates of 100 mm width and 5 thickness  $s$  shown in figure



Which one of the following statements is correct for the same value of bending stress in the timber ?

- a. Moment of resistance in figure – I will be more than that in figure – II
- b. Moment of resistance in figure – II will be more than that in figure – I
- c. Moment of resistance in figure – I will be more than that in figure – II
- d. No logical comparison