



Sample Question Paper for Mechanics of Solids (MOS)

Q1. Solve all questions mandatory

02 marks each

Q1. a A vertical column has two moments of inertia (i.e. I_{xx} and I_{yy}). The column will tend to buckle in the direction of the_____

- I. Axis of load
- II. perpendicular to the axis of load
- III. maximum moment of inertia
- IV. minimum moment of inertia

Q1.b The neutral axis of the cross-section a beam is that axis at which the bending stress is_____

- I. Zero
- II. Minimum
- III. Maximum
- IV. Infinity

Q1. c Euler's formula holds good only for_____

- I. Short columns
- II. Long columns
- III. Both short and long columns
- IV. Weak columns

Q1. d In the torsion equation $\frac{T}{J} = \frac{\tau}{R} = \frac{C \theta}{l}$ the term J/R is called_____

- I. shear modulus
- II. section modulus
- III. polar modulus
- IV. none of these

Q1. e The maximum stress produced in a bar of tapering section is at_____

- I. smaller end
- II. Larger end
- III. Middle
- IV. Anywhere

- Q1. f Strain energy is the _____
- I. Energy stored in a body when strained within elastic limits
 - II. Energy stored in a body when strained upto the breaking of a specimen
 - III. Maximum strain energy which can be stored in a body
 - IV. Proof resilience per unit volume of a material
- Q1. g The slope of the stress-strain curve in the elastic deformation region is _____
- I. Elastic modulus
 - II. Plastic modulus
 - III. Poisson's ratio
 - IV. None of the mentioned
- Q1. h What is the stress-strain curve?
- I. It is the percentage of stress and strain
 - II. It is the relationship between stress and strain
 - III. It is the difference between stress and strain
 - IV. None of the mentioned
- Q1. i Which point on the stress strain curve occurs after the lower yield point?
- I. Yield plateau
 - II. Upper yield point
 - III. Ultimate point
 - IV. None of the mentioned
- Q1. j A simply supported beam of span "x" meters carries a udl of "w" per unit length over the entire span, the maximum bending moment occurs at _____
- I. At point of contra flexure
 - II. Centre
 - III. End supports
 - IV. Anywhere on the beam
- Q1. k What is the variation in the BM, if the simply supported beam carries a point load at the centre.
- I. Triangular
 - II. Rectangular
 - III. Trapezoidal
 - IV. Other quadrilateral
- Q1. l The maximum _____ stresses occur at top most fibre of a simply supported beam.

- I. Tensile
- II. Compressive
- III. Shear
- IV. Bending

Q1. m The effective length of column depends upon _____

- I. the cross section of beam
- II. end conditions
- III. maximum bending moment
- IV. extreme fibres

Q1. n Shear stress at top most fibre of rectangular section is _____

- I. Maximum
- II. Minimum
- III. Zero
- IV. Uniform through out

Q1. o A shaft is said to be in pure torsion if _____

- I. Turning moment is applied at one end and other end is free
- II. Turning force is applied at one end and other end is free
- III. Two opposite turning moments are applied to the shaft
- IV. Combination of torsional load and bending load is applied to the shaft

Q1. p The relationship between Young's modulus (E), Bulk modulus (K) and Poisson's ratio (μ) is given by _____

- I. $E=2K(1-2\mu)$
- II. $E=3K(1-2\mu)$
- III. $E=2K(1-2\mu)$
- IV. $E=2K(1-3\mu)$

Q1. q The total extension of a taper rod of length 'L' and end diameters 'D1' and 'D2', subjected to a load (P), is given of _____

- I. $4PL/\pi E. D1D2$
- II. $3PL/\pi E. D1D2$
- III. $2PL/\pi E. D1D2$

IV. PL/IE.D1D2

Q1. r Elongation of a bar of uniform cross section of length 'L', due to its own weight 'W' is given by_____

- I. $2WL/E$
- II. WL/E
- III. $WL/2E$
- IV. $WL/3E$

Q1. s column that fails due to direct stress is called _____

- I. Short column
- II. Long column
- III. Medium column
- IV. Slender column

Q1. t Design of a thin shell under pressure is done on the basis of _____

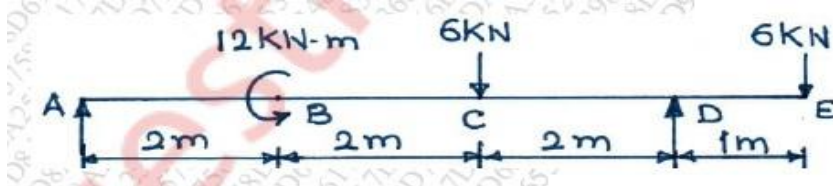
- I. Radial stress
- II. Longitudinal stress
- III. Hoop stress
- IV. All the three stresses

Q2 Solve any two

10 marks each

Define Point of Contra flexure. Draw the shear force and bending moment diagram for diagram as shown in figure and locate position of point of contra flexure.

Q2.a



Q2.b

A T-section with flange 200 mm x 50 mm and web 200 mm x 50 mm is subjected to a vertical shear force of 200 KN. Calculate Shear stress at the junction of the flange and web and Shear stress at the Neutral axis. Sketch the shear stress distribution diagram.

Q2.c

A cylindrical shell 100 cm long and 20 cm internal diameter having thickness of metal as 10 cm is filled with fluid at atmospheric pressure. If an additional 20cm³ of fluid is pumped into the cylinder, find (i) the pressure exerted by the fluid on the cylinder and (ii) the hoop stress induced.

Take $E = 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.3

Q3 Solve any four

05 marks each

Q3.a

Find the Rankine's crippling load for a hollow cylindrical cast iron column 200 mm external diameter, 25 mm thick, 6 m long and fixed at both ends. Take $\alpha = 1/1600$ and $\sigma_c = 500 \text{ N/mm}^2$.

- Q3.b A short column of external diameter 500 mm and internal diameter 250 mm, carries an eccentric load of 100 kN. Find the greatest eccentricity which the load can have without producing tension on the cross section.
- Q3.c Derive the relation between three moduli (E,G and K)
- Q3.d Draw the shear force and bending moment diagrams for a cantilever of length L carrying a uniformly distributed load of w per unit length over the entire length
- Q3.e A reinforced concrete column of 400 mm diameter supports a load of 500 KN axially. The Reinforcement consists of 8 steel rods each of 20 mm diameter Find how much stresses develop in the rods and the concrete of if Young's modulus of steel is 18 times that of concrete.