

## **Question Bank of SOM (22306)**

### **Unit Test-I (Shift:-I)**

Program: - Mechanical Engg.

Course Code:- 22306

Semester: - III

Course: - SOM

### **Question for 2 Marks**

#### **Chapter 01 (CO1)**

- 1) State theorem of parallel axis for moment of inertia along with a diagram.
- 2) Define polar moment of inertia. Also state perpendicular axis theorem of M.I.
- 3) Find polar moment of inertia of a circle of 50 mm diameter.
- 4) Define : i) Moment of Inertia and ii) Radius of Gyration

#### **Chapter 02 (CO2)**

- 1) Define :- 1) Stress and 2) Strain. Give its unit.
- 2) Explain single shear and double shear
- 3) State the Principle of Superposition.
- 4) Draw stress-strain diagram for ductile material in tension.

#### **Chapter 03 (CO3)**

- 1) Define Poison's ratio. Also state common value of Poison's ratio for C.I.
- 2) Define :- 1) Bulk modulus and 2) Modulus of elasticity
- 3) Define Strain energy and Modulus of Resilience.
- 4) Differentiate between sudden loading and impact loading? Also state the example of each type of loading.

#### **Chapter 04 (CO4)**

- 1) State the types of beams. Draw a sketch of any one of it.
- 2) Define shear force and bending moment.
- 3) State the relation between S.F. and B.M. and rate of loading.

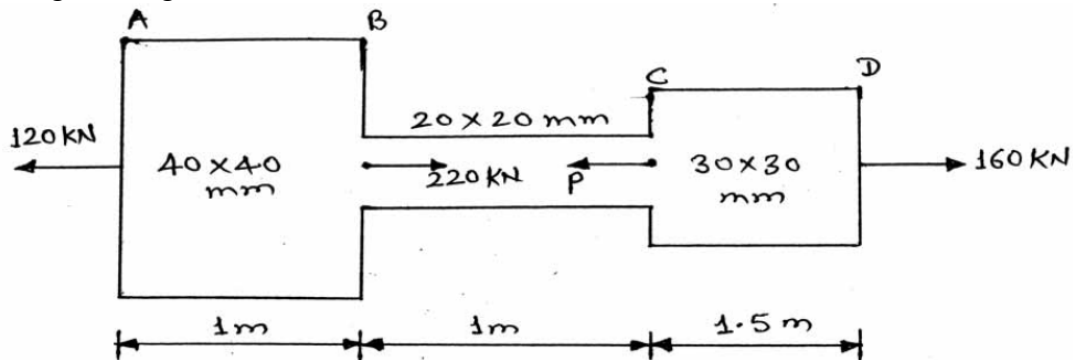
## Question for 4 Marks

### Chapter 01 (CO1)

- 1) Find the moment of inertia of a square of side 'a' about its outer edge.
- 2) An isosceles triangular section ABC has base width 80 mm and height 60 mm. Determine the M.I. of the section about the C.G. of the section and the base BC.
- 3) A channel section 100 cm × 100 cm × 30 cm thick. Find the moment of inertia about centroidal axis X-X and Y-Y.
- 4) An angle section 120 mm × 100 mm × 20 mm is placed such as its longer leg is vertical. Calculate M.I. about centroidal horizontal axis.
- 5) A T-section has flange 120 mm × 20 mm and web 15 mm × 120 mm, overall depth 140 mm. Calculate M.I. about its vertical centroidal yy-axis. [i.e.  $I_{yy}$  only]
- 6) A hollow square has inner dimensions 80×80 mm and outer dimensions 120 mm × 120 mm. Find the moment of Inertia about the outer size.

### Chapter 02 (CO2)

- 1) A steel rod 12 mm dia. and 2.2 m in length is at 40°C. Find expansion of rod if the temperature is raised to 110°C. If this expansion is fully prevented, find the magnitude and nature of the stress induced in the rod.  
Take  $E = 2.1 \times 10^5 \text{ N/mm}^2$  and  $\alpha = 12 \times 10^{-6}/^\circ\text{C}$ .
- 2) A rod 300 mm long and 20 mm in diameter is heated through 100°C and at the same time pulled by a force P. If the total extension is 0.4 mm, what is the magnitude of P ?  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $\alpha = 12 \times 10^{-6}/^\circ\text{C}$ .
- 3) A bar of cross section 20 mm × 20 mm is axially pulled by a force 'P' KN. If the maximum stress induced in the bar is 50 MPa, determine 'P'. If elongation of 1.2 mm is observed over a gauge length of 3 m; determine Young's Modulus.
- 4) Find the required diameter of steel rod that has to carry an axial pull of 40 kN, if the permissible stress is 150 MPa.
- 5) A member ABCD is subjected to loads as shown in Fig. 1. Find the force 'P' and net change in length of the member. Take  $E = 2 \times 10^5 \text{ N/mm}^2$

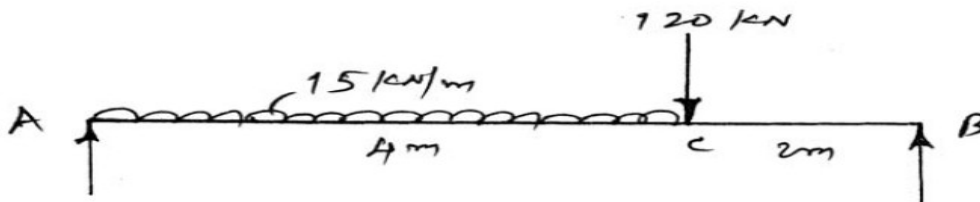


### Chapter 03 (CO3)

- 1) For a certain material,  $E = 2.8 K$  (Where  $E =$  Modulus of Elasticity and  $K =$  Bulk Modulus) calculate Poisson's ratio. Also calculate the ratio of Young's modulus to the modulus of Rigidity.
- 2) For a round bar of 50 mm diameter and 2.5 m long, a certain material has Young's modulus of  $1.1 * 10^5 \text{ N/mm}^2$  and modulus of rigidity is  $0.45 * 10^5 \text{ N/mm}^2$ . Find the bulk modulus and the lateral contraction of the bar when stretched by 3 mm.
- 3) A metal rod of 20 mm diameter and 1.8 m long when subjected to an axial tensile force of 58 kN showed an elongation of 2.2 mm and reduction in diameter was 0.006 mm. Calculate Poisson's ratio and modulus of Elasticity.
- 4) A steel rod 20mm in diameter is 200mm long. It is subjected to an axial pull of 40 kN. Calculate the strain energy stored in the rod if the load is applied. : a) gradually b) suddenly. Take  $E=210\text{GPa}$ .
- 5) A steel flat is subjected to bi-axial tensile stresses. The tensile stress along X-direction is  $42\text{N/mm}^2$ . Determine the value of tensile stress along Y-direction if the strain in that direction is zero. What will be the strain in the X-direction if  $E=2 \times 10^5 \text{ N/mm}^2$  and  $\mu=0.3$ ?
- 6) A steel cube of 50 mm side is subjected to a force of 6 kN ( tensile), 8 kN (Compressive), 4 kN (tensile) along x ,y,and z direction respectively. Determine the change in volume of the block. Take  $E = 210 \text{ GPa}$  and  $\mu = 3/10$

### Chapter 04 (CO4)

- 1) Draw shear force and bending moment diagram for simply supported beam of span 4 m with overhangs of 2m on both side and carrying uniformly distributed load of 10 kN/m over the whole length and point load of 20 kN at 1 m from left hand support.
- 2) Draw shear force and bending moment diagram for a cantilever beam AB of 4 m long having its fixed end at A and loaded with uniformly distributed load of 2 kN/m over entire span and point load of 3 kN acting upward at the free end of cantilever. Find point of contraflexure if any.
- 3) Figure No. 1 shows a simply supported beam carrying loads. Draw shear force diagram and BMD.



- 4) Draw SF and BM diagram for a simply supported beam of span L carrying a udl w/unit length over the entire span.
- 5) Draw SFD and BMD for a cantilever beam 1.75 m long carrying a udl of 12 kN/m run over a length of 1.2 m from the fixed end.