# BHARATI VIDYAPEETH INSTITUTE OF TECHNOLOGY

## Question Bank (K-Scheme)

## Unit Test: I

**Name of subject: Strength of Materials** **Subject code: 313308**

**Course: ME** **Semester-III**

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## Unit 01:- Moment of Inertia (CO1)

1) Define: i) Moment of Inertia ii) Radius of Gyration. State its S.I. unit

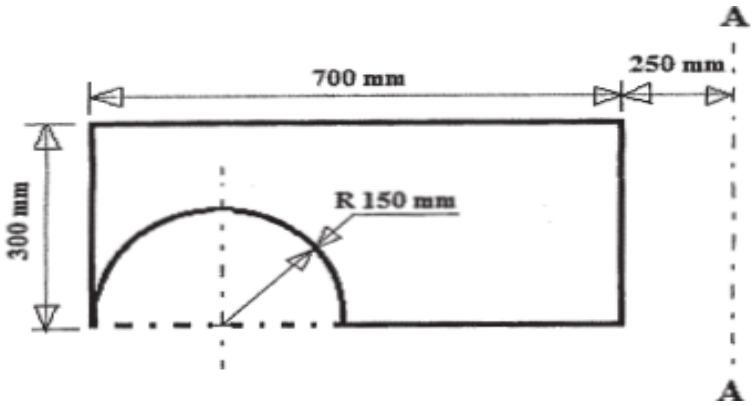
2) State Parallel Axis Theorem.

3) State Perpendicular Axis Theorem.

4) Define: Polar Moment of inertia

5) A hollow circular section with 200 mm external and 100 mm internal diameter. Using parallel axis theorem calculate M.J. about any of its tangent.

6) Calculate the moment of inertia about the axis A-A, for the lamina shown in the Figure.




7) Calculate the moment of inertia of a hollow rectangle about an axis passing through base 200 mm size. The internal dimension and external dimensions of rectangle are 160 mm × 260 mm and 200 mm × 300 mm respectively.

8) A symmetrical I-section of overall depth of 300 mm has its flanges 150 mm × 10 mm and web 10 mm thick. Calculate moment of inertia @ XX and YY censorial axes.

9) Find moment of inertia of angle ISA : 100 mm × 75 mm × 6 mm about the centroidal XX and YY axis.

10) Calculate M.I. of a T-section about the centroidal xx axis. Top flange is 1200 mm × 200 mm and web is 1800 mm × 200 mm. Total height is 2000 mm.

## Unit 02:- Simple Stresses, Strains & Elastic Constants (CO2)

1) Define shear strain and modulus of rigidity.

2) State the relation between Young's modulus and Bulk modulus.

3) Draw stress-strain curve for ductile material showing salient points on it. Also, define yield stress and ultimate stress on it.

4) Define Poisson's ratio and state the relation between three elastic constants E, G and K.

5) Define : Creep, Toughness.

6) Define stress and strain and state its S.I. unit.

7) For a certain material, E = K. Calculate E/G & Poisson's ratio.

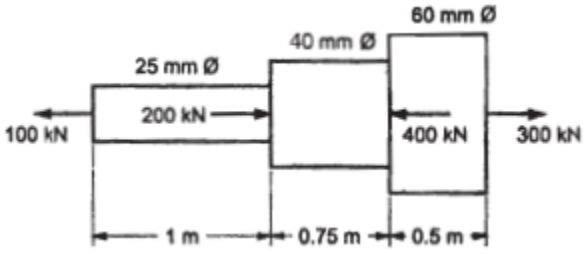
8) In a tri-axial stress system, the stresses along the three directions are σx = 100 N/mm2 (tensile), σy = 60 $N/mm^2$ (tensile) and σz = 30 $N/mm^2$ (compressive). Find the strains in each direction. Take E = $2 \times 10^5$ N/mm2 and μ = 0.25. If X = 400 mm, Y = 150 mm and Z = 300 mm. Also calculate the change in volume.

9) With neat sketches show the failure of rivet in single shear and double shear. Also write the formulae to calculate shear stress for each case. Assume diameter of rivet = d.

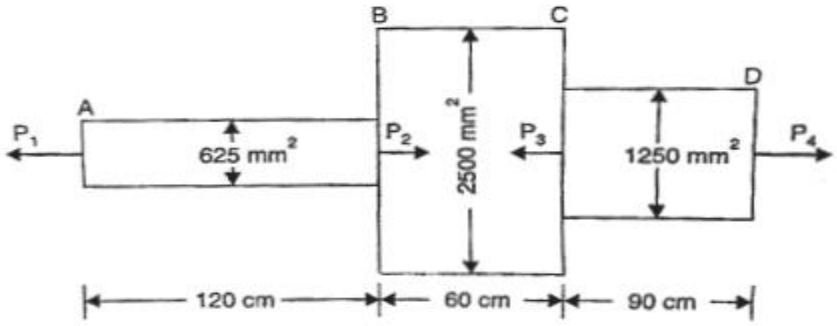
10) A steel tube 40mm inside diameter and 4 mm metal thickness is filled with concrete. Determine the stress in each material due to an axial thrust of 60 KN. Take E for steel = 2.1 x $10^5$ MPa. E for concrete = 0.14 x $10^5$ $N/mm^2$

11) A metal bar 200 mm long, 40 mm × 30 mm in cross section is subjected to stress of 110 MPa along the length and 50 MPa on other two faces. All stresses are tensile. Calculate strains along the three direction and also the volumetric strain. Assume E = 120 MPa and μ = 0.30.

12) A steel bar is subjected to axial loads as shown in Fig. Calculate deformation of the bar. Take E = 210 GPa.




13) b) A member ABCD is subjected to point loads of P1, P2, P3 and P4 as shown in Figure No. 1. Calculate the force P2 necessary for equilibrium, if P1 = 45 kN, P3 = 450 kN and P4 = 130 kN. Determine the total elongation of the member, assuming the modulus of elasticity to be $2.1 \times 10^5$ $N/mm^2$.

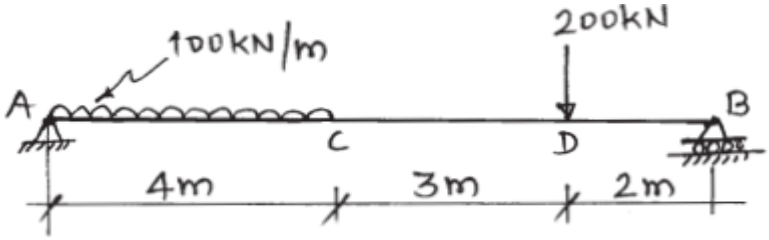



## Unit 03:- Shear Force and Bending Moment (CO3)

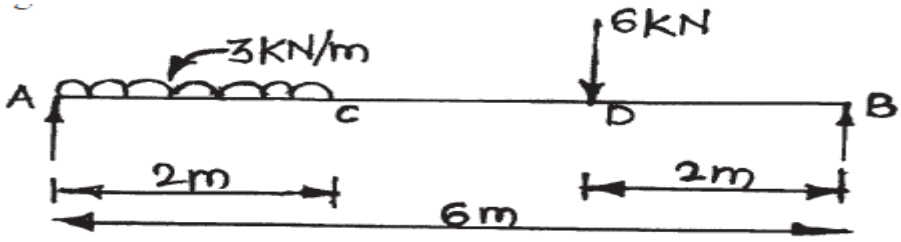
1) In case of simply supported beam, State the point at which B.M. is maximum, when it carries full span of U.D.L.

2 ) A simply supported beam of span 'L' is subjected to downward point load of 'W' at a distance 'a' from left support and 'b' from right support. Draw SF and BM diagrams. Take a > b.

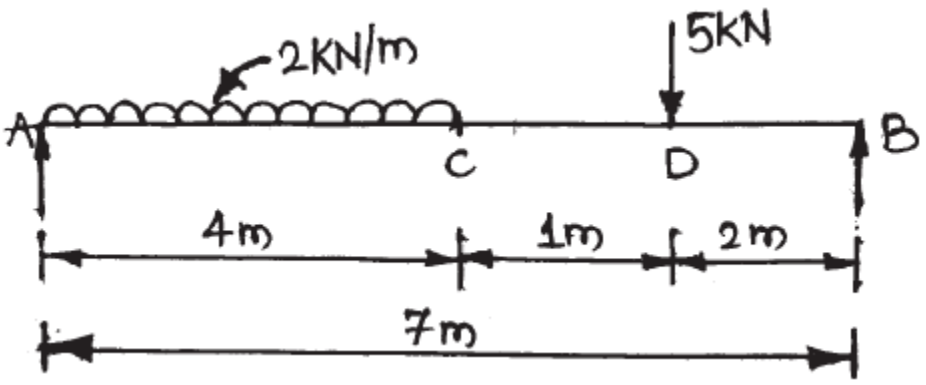
3) A simply supported beam is loaded as shown in Fig. No. Draw shear force diagram and locate the position from support 'A' where B.M. is maximum. Also calculate value of Maximum B.M.



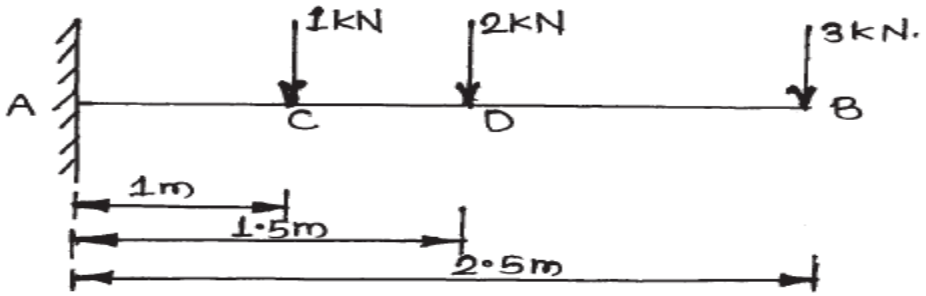

4) Draw S.F.D. & B.M.D. for a simply supported beam as shown in Fig.




5) Draw S.F.D. and B.M.D. for a beam as shown in Fig.




6) Draw S.F.D. and B.M.D. for the beam as shown in Fig.




7) Draw S.F. and B.M. diagrams with all important values for the beam loaded as shown in Fig.