(39) SE-CIVIL (CBGS) Sem-III Som 07/12/201

Q.P.Code: 27319

(3 hours) **Total Marks :80**

NOTE-
1. **Question No 1** is **compulsory.** Answer **any 3** from remaining **5** questions.
2. **Illustrate** you answers with **neat sketches** where ever necessary.
3. **Assume** suitable data wherever necessary if not given. However **justify** the same.

Q.1 Answer the following (any four)

a) What do you mean by " Pure Bending " and the term " Beam of uniform strength " **5**

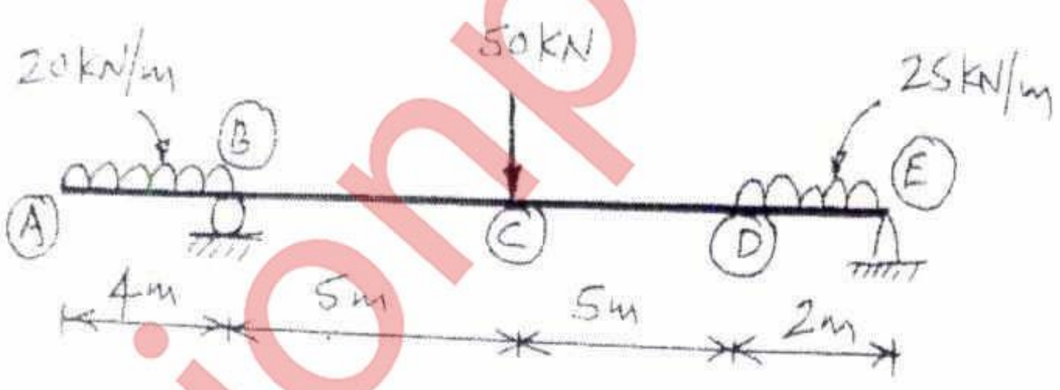
b) State the relationship between modulus of elasticity, modulus of rigidity and bulk modulus. **5**

c) State the assumptions made in theory of Torsion. **5**

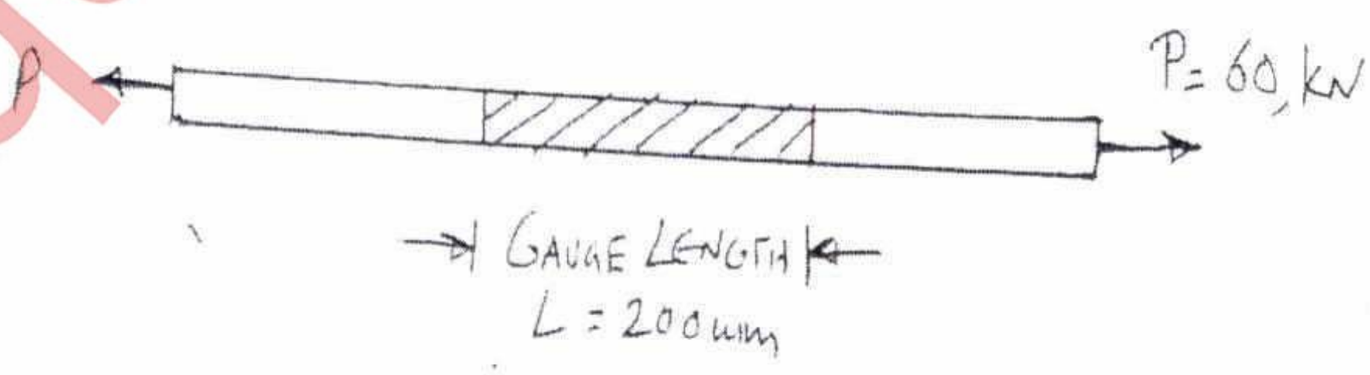
d) Derive the expression for volumetric strain for a thin cylindrical shells **5**

e) Draw shear stress distribution diagram for , T(inverted) ,C (channel) ,and I (symmetrical & un symmetrical) section **5**

Q.2 **a)** Draw SFD and BMD for the beam loaded as shown in figure below-. **8**

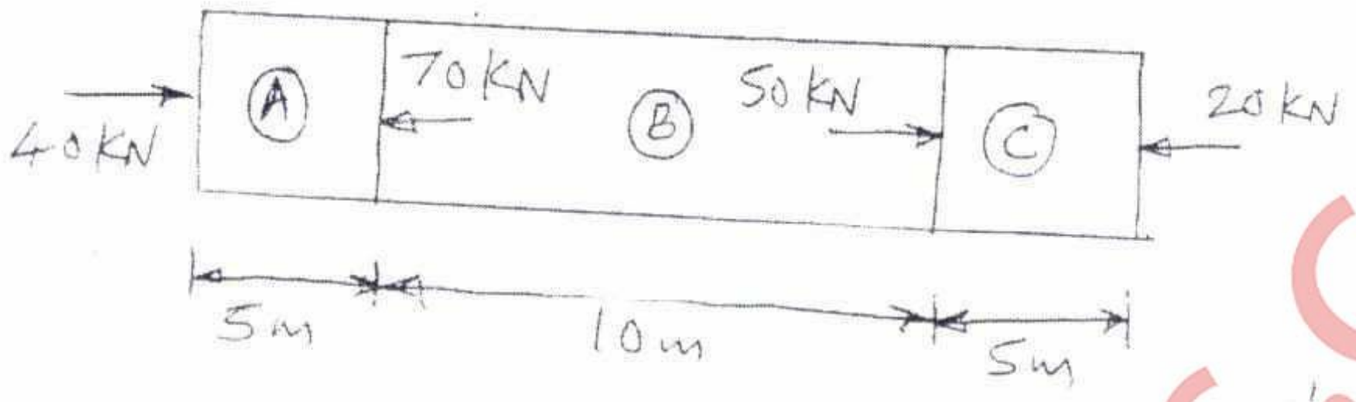


b) In an experiment a bar of 30 mm diameter is subjected to an axial pull of 60 KN. The measured extension on gauge length of 200 mm and is 0.09 mm and the change in diameter is 0.0039 mm. Calculate the Poisson's ratio and the values of three elastic modulus. **6**



Turn Over

c) A bar 20m long an 400mm^2 in cross section carries a axial load as shown . Calculate the deformation of the bar. Take E = 200 KN/mm^2. **6**



Q.3 a) A copper rod 36 mm in diameter is encased and rigidly attached at the end of a steel tube which is 50 mm external diameter, thickness of metal being 5 mm. The composite section is then subjected to an axial pull of 100 KN. Find the stresses induced in each metal and extension on the length of 1.5m .Take E_S = 2x10^5 N/mm^2 and E_C = 1.1x10^5 N/mm^2. **8**

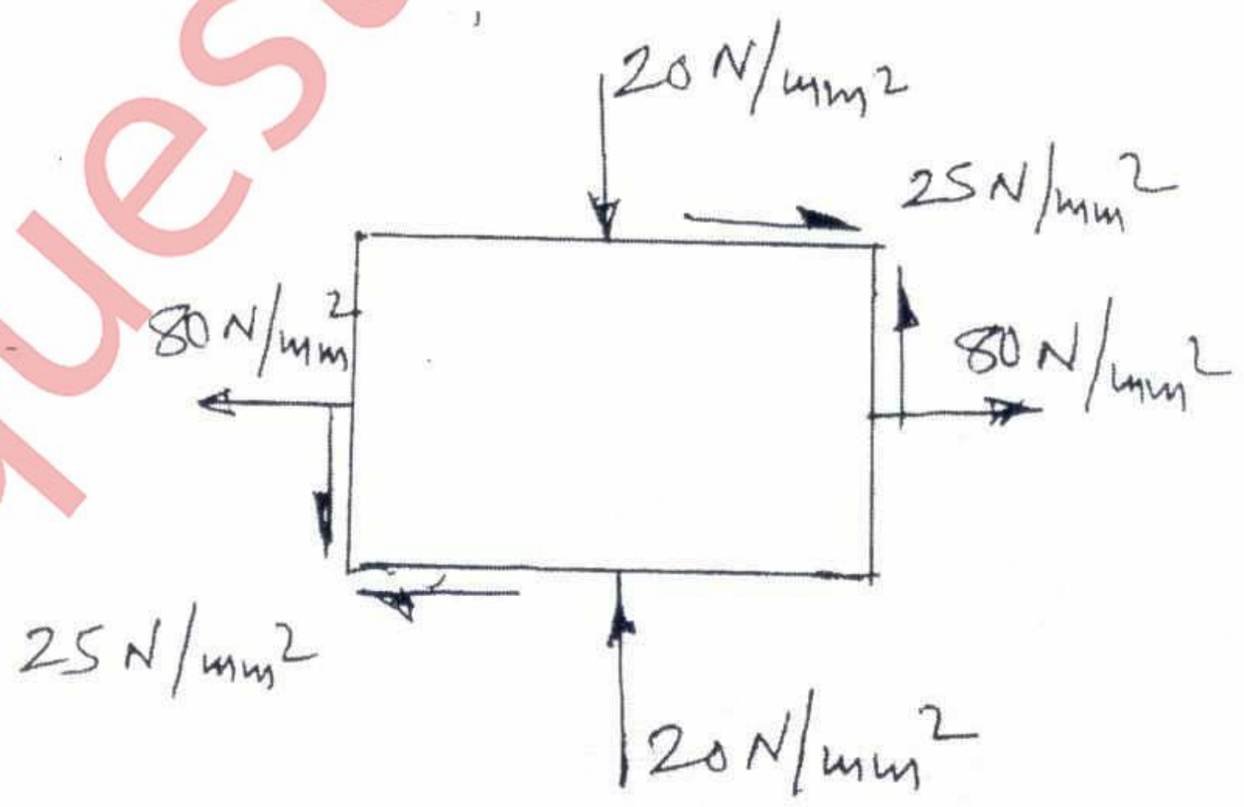
b) A T beam of span 5 m has a flange 125 mm x 12.5 mm and web 187.5 mm x 8 mm. If the maximum permissible stress is 150 MPa, find the maximum udl the beam can carry. **6**

c) Derive Flexural formula. (Bending Equation) **6**

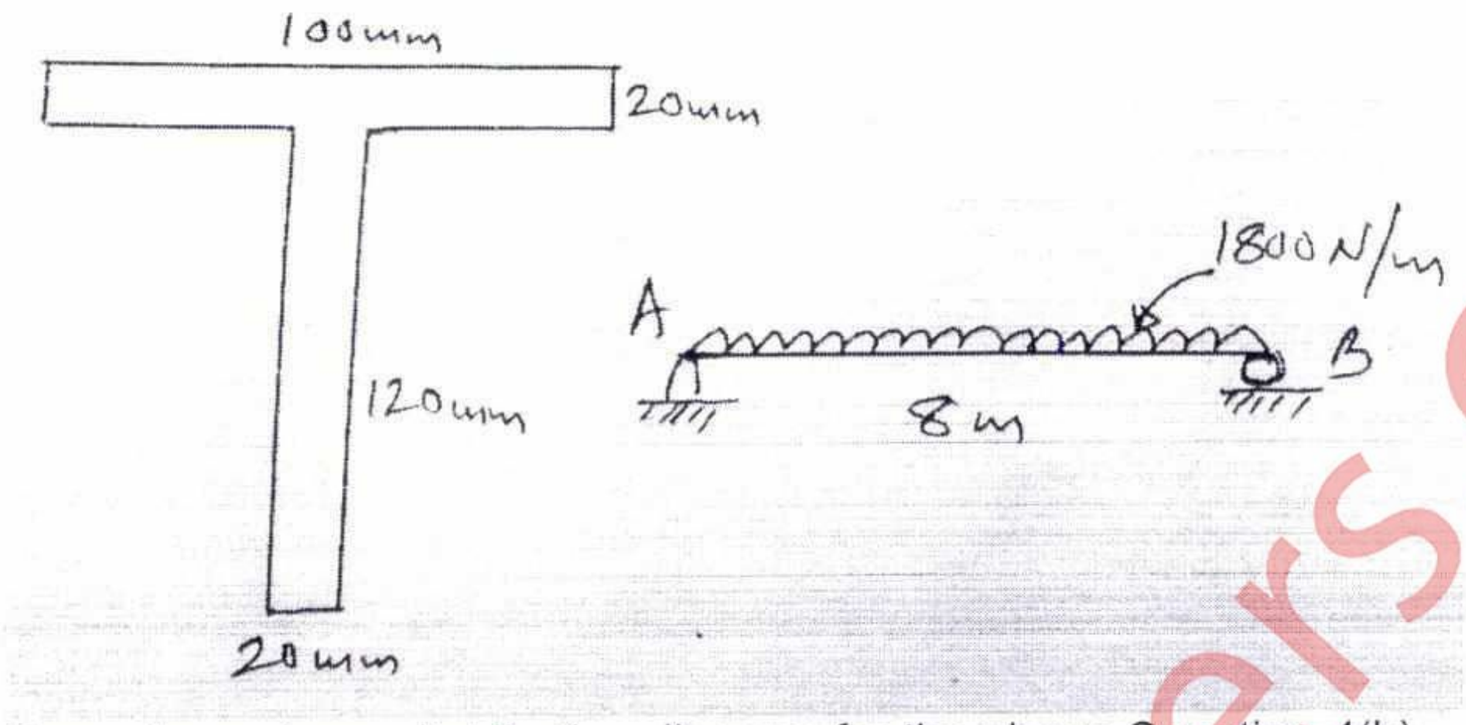
Q.4 a) A plane element in the body is subjected to the stresses as shown in the figure. Determine **8**

(i) The magnitude of principle stresses & respective principal planes.

(ii) Maximum shear stresses and the plane on which they occur. Sketch the stresses on properly oriented planes. Solve analytically or graphically.



b) A cast iron beam is of T section as shown in figure. Sketch the bending distribution diagram at point C. **6**



c) Draw shear stress distribution diagram for the above Question 4(b) **6**

Q.5 **a)** A short vertical column is of rectangular section 40 cm x 30 cm. It carries a load 80 KN at a point 5 cm away from the centre of the section along one of the diagonals. Calculate the intensity of the stress at the corners of the column in the plan. **8**

b) Determine suitable diameter of a solid shaft to transmit 1 MW power rotating at 220 RPM, if the following working conditions are to be satisfied - **8**

a. the shaft must not twist more than 1 degree on length of 12 times the shaft diameter and
b. the shear stress must not exceed 60 N / mm^2.

Take G = 84 KN/mm^2.

c) What do you mean by Middle third rule? Explain with neat sketches. **4**

Q.6 **a)** A cylindrical shell 1 m in diameter and 3 m in length has a metal thickness of 10 mm. If it is subjected to an internal pressure of 3 N/mm^2, determine change in length, change in diameter and change in volume. Take E_S = $2x10^5$ N/mm^2 and Poisson's ratio = 0.3 **8**

b) Find Euler's Crippling load for a hollow cylindrical column of 80 mm external diameter and 10 mm thick. Both ends of the column are fixed and length of column is 5.5 m. Take E_S = $2x10^5$ N/mm^2. Also determine Rankine's crippling load for the same column. Take f_C= 350 MPa and Rankine's constant α = 1/7500 **8**

c) Define the terms- (i) slenderness ratio (ii) radius of Gyration (iii) torsional rigidity and (iv) core ore kernrl of a Section **4**

Subject: Correction: T0923 / T1473 - STRENGTH OF MATERIALS QP code : 27319

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To: controllerktc@yahoo.com;

Date: Thursday, 7 December 2017 4:27 PM

University of Mumbai

Correction: T0923 / T1473 - STRENGTH OF MATERIALS **QP code : 27319**
Question No. 4(b): point C in the Diagram shall be taken at the centre of length AB.

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