GANPAT UNIVERSITY

B. Tech. (ME/MC) (3rd Semester) -New CBCS- Regular Examination – Nov/Dec : 2016

2 CI 311: STRENGTH OF MATERIALS

Max. Time: 3 Hours **Max. Marks: 60**

Instructions: - (1) Answer to the two sections must be written in **separate** answer books.

(2) Figures to the right indicate **full** marks.

(3) Assume suitable data if required.

Section – I

1 **(A)** A beam of 4m length is supported by simply support at 1m and 3m from the left end respectively. It is carrying a U.V.L. of 15 KN/m gradually increase from the left end on 1m length, an U.D.L. of 10 KN/m running between two support, and a point load of 20 KN at the right end. Draw the shear force and bending moment diagram and Shaw all the important values. **(07)**

(B) What do you mean by 'simple bending'? What are the assumptions made in the theory of simple bending? **(03)**

2 **(A)** Define and explain the terms: Section of Modulus and Flitched Beams. **(05)**

(B) A simply supported beam is made up of an I-section having flange section 200 mm × 20 mm and web section 10 mm × 30 mm. The section carries a shear force 120 KN. Determine maximum shear stress value and draw shear stress distribution diagram **(05)**

OR

2 **(A)** Shown that for a rectangular section of the maximum shear stress is 1.5 times the average stress. **(03)**

2 **(B)** A steel plate of width 100mm and depth 30 mm is placed symmetrically below a brass plate of width 100mm and depth 40mm to form composite beam. Determine the moment of resistance when the plates are allowed to bend independently and when they are guided together to bend as as composite beam. Take $E_{steel} = 2\ E_{brass}$. Allowable stress in steel and brass are 120 MPa and 60 MPa respectively. **(07)**

3 **(A)** What do you mean by direct stress and bending stress? Also show that an eccentric load causes a direct stress as well as bending stress. **(05)**

(B) A point is subjected to tensile stresses of 200 MPa and 150 MPa on two mutually perpendicular planes and anticlockwise shear stress of 30 MPa. Determine values of normal and shear stresses on a plane inclined at 60° with the normal to tensile stress. **(05)**

OR

3 (A) Derive an expression for the stresses on an oblique section of a rectangular body, when it is subjected to direct stresses in two mutually perpendicular directions.

(B) A hollow rectangular column of external depth 1.2 m and external width 0.9 m is 15 mm thick. Calculate the maximum and minimum stresses in section of the column& plot the stresses along the width, if a vertical load of 210 kN is acting with an eccentricity of a) 15 mm & b) 100 mm. (05)

Section - II

4 (A) Explain the stress strain diagram for mild steel material. (05)

(B) A circular bar rigidly fixed at its both ends is 1.2 m long. It uniformly tapered from 100 mm at one end to 80 mm at the other. What is the maximum stress induced in the bar, when its temperature is raised through 25 K? Take E = 200 GPa and $\alpha = 12\times10^{-6}$/K. (05)

5 (A) Enlist the different methods for determine slope and deflection, and explain the double integration method. (05)

(B) A strut is 2 m long and has a rectangular cross section 30 mm x 20 mm. The bottom is built into a ground socket and the top is completely unrestrained. Take E = 200 GPa to calculate the buckling load. (05)

OR

5 (A) Explain Short and Long Column and enlist assumptions made in Euler's theory. (05)

(B) A wooden beam 6 m long, simply supported at its ends, is carrying a point load of 8.0 KN at its center. The cross-section of the beam is 150 mm wide and 260 mm deep. If E for the beam = 6×10^3 N/mm^2, find the deflection at the center. (05)

6 (A) Explain types of riveted joints with neat sketches. (05)

(B) A shaft is made from tube. The ratio of the inside diameter to the outside diameter is 0.8. The material must not experience a shear stress greater than 600 KPa. The shaft must transmit 1.5 MW of mechanical power at 1500 rev/min. Calculate the shaft diameters. (05)

OR

6 (A) Derive the torsion equation (05)

(B) A plate 120 mm X 10 mm is welded to another plate 120 mm X 15 mm in lap joint fashion. It is subjected to load 120 KN. Use weld stress 100 MPa. Determine fillet weld size, such that the stresses in both fillets are same. (05)

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