GANPAT UNIVERSITY

B.Tech. 3rd Semester (Mechatronics), MC – 306

Regular Examination : Nov- Dec : 2011 STRENGTH OF MATERIALS

Instructions: -

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

(2) Assume suitable data if required.

(3) Figures to the right indicate full marks.

Invigilator's Sign.: _____

Exam. No. of the candidate: _____

Max. Marks: 70

Max.Time: 3 Hours

Section - I

1 (A) What is pure bending? Explain giving at least two examples. Also describe assumption made in theory of pure bending. (06)

OR

1 (A) Derive classic flexural formula based on theory of pure bending. (06)

1 (B) A flitched beam consists of a wooden joist 20 cm wide and 40cm deep strengthened by steel plate 2 cm thick and 20 cm deep, one on either side of the joist. If the stresses in wood and steel are not exceed 10 MN/m2 and 150 MN/m2, Find the moment of resistance of the section of the beam .Take Es = 25Ew. (07)

2 Attempt any Two: (12)

(A) Prove that shear stress distribution equation for circular section of a beam.

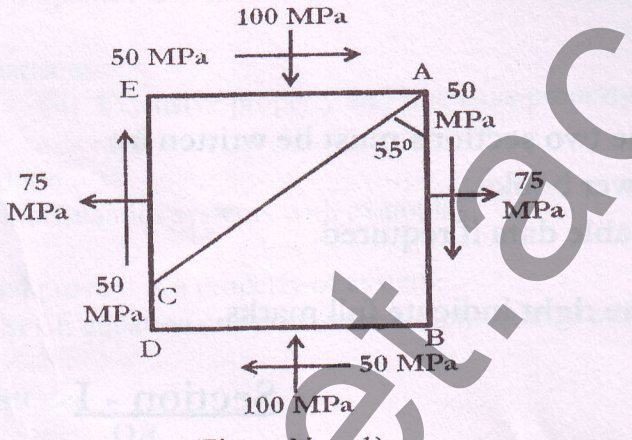
(B) Derive the relation to find out the shear stress at any section.

(C) At a given section of I beam, the value of vertical shear force is 40 kN and the sectional dimensions are Flange width (top and bottom) =200 mm, Flange thickness (top and bottom) = 30 mm,web thickness =40 mm and total depth =300 mm. Draw the shear stress distribution diagram for the given section.

gtu.infinet.ac.in

3 (A) Define the following teams: (I) Principal plane,(II) Major and minor principal planes,(III) Principal stress,(IV)major and minor principal stresses. (0

(B) For the stress system as shown in figure-1, find normal stress, shear stress and resultant stress on inclined plane AC. Also find principal stresses, principal planes, maximum/minimum shear stresses and their planes. Use analytically and graphical method. (08)



(Figure No – 1)

Section – II

4 (A) Derive the Euler's crippling load for column subjected to eccentric loading. (06)

(B) A hollow Cylindrical cast iron column is 3.5 m long with both ends fixed. Determine the minimum diameter of column, if it has to carry a safe load of 250 KN with a factor of safety of 5. Take the internal diameter as 0.7 times the external diameter. (06)

OR

4 (A) Prove that the torque transmitted by a solid shaft when subjected to torsion is given by $T = (\pi/16) \times fs \times d^3$ (06)

(B) A double riveted double cover butt joint is used for connecting plates 20 mm thick. The diameter of the rivets is 25 mm. The permissible stresses are 120 MPa in tension, 90 MPa in shear and 180 MPa in crushing. Draw neat sketch of the joint and calculate the necessary pitch and efficiency of the joint. (06)

5 (A) Derive the relation between Slope, Deflection and Radius of Curvature of a simply supported beam. (05)

(B) A steel girder of uniform section, 15 m long is simply supported at its ends. It carries concentrated loads of 90 KN and 60KN at two points 3 m and 4.5 m from the two ends respectively. Calculate the deflection of the girder at the points under the two loads. (06)

gtu.infinet.ac.in

OR

5 (A) What are the different types of riveted joint? Explain clearly with neat sketches. (05)

(B) A thin cylindrical shell with following dimensions is filled with a liquid at atmospheric pressure: length =1.2m, external diameter= 200mm, thickness of metal= 8mm. Find the value of pressure exerted by the liquid on the walls of the cylinder and the hoop stress induced if an additional volume of 26 cm^3 of liquid is pumped into the cylinder. Take E= 2.1 x 10^5 MPa and Poisson's ratio = 0.33 (06)

6 (A) Derive an expression for circumferential stress produced if the efficiency of the longitudinal joint is η for a thin cylindrical shell of internal dia d, wall thickness t, and length l, subjected to internal pressure p. (06)

(B) The stiffness of a closely coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shearing stress produced in the wire of the spring is 125 N/mm2. The solid length of the spring (when the coils are touching) is given as 5cm. Find: (i) Diameter of wire; (ii) Mean diameter of coil; (iii) Number of coils required. Take C=4.5 x 10^4 MPa (06)

"End of Paper"

gtu.infilibnet.ac.in