GANPAT UNIVERSITY

B.Tech. 3rd Semester (Mechanical),
Regular Examination : Nov- Dec : 2011

2ME – 302
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. (04)

(B) Mention the difference between Bending moment and Moment of resistance. (02)

(C) Derive the relation to find out the shear stress at any section. (05)

2 (A) An overhanging beam having a length of 6.5 m is simply supported over 5m apart and overhang of 1.5 m at right side. The beam carries a uniformly distributed load on entire overhang span of beam of 2kN/m and point load of 30 kN act at 2m from the left side of beam. Beam cross section is timber T beam has the following dimensions: overall depth =300 mm, flange width =200 mm , flange thickness = 100 mm and web thickness = 100 mm. Calculate the bending stress and shear stress distribution for a beam at each point and also draw bending stress and shear stress distribution for a beam. (12)

OR

2 (A) Derive expressions for normal, tangential, resultant, major principal and minor principal stresses by analytically method. Stresses on an oblique section of a body subjected to a uniaxial stress accompanied by a simple shear stress. (12)

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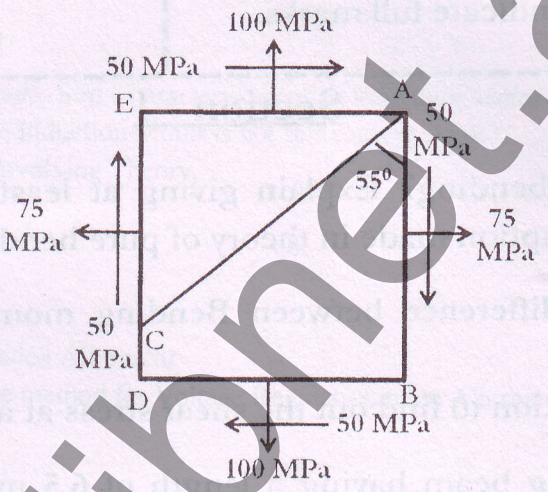
3 Attempt any Three:

(A) An I beam having 60 mm x 20 mm top and bottom flanges and 20 mm x 100 m web respectively is a cantilever beam of span 3 m and subjected to U.D.L. of 1 KN/m over the entire span. Draw the bending stress distribution diagram for the beam section for maximum bending moment.

(B) A rectangular beam is to be cut form a circular log of wood of diameter D.Find the ratio of dimensions for the strongest section in bending.

(C) 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 graphical method.



(Figure No - 1)

(D) Draw shape of shear distribution diagrams for the beams having following cross sections under a shear force 'S'(I) Hollow rectangular and hollow circular shape, (II) I-shape and channel 'H' shape, (III) Triangle and composite section, (IV) T shape and Inverted T shape.

Section – II

4 (A) Derive an expression for the Euler's Crippling load for a column with both Ends Fixed. Also define 'equivalent length of column'. (06)

(B) From the following data, determine thickness of cast-iron column: (06)

Length of column = 6 meter, External diameter = 200 mm, Load = 500 KN, Factor of safety = 6, Ultimate compressive stress = 570 MN/m^2, a = 1/1600.Assume both ends are fixed.

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OR

(A) Derive the relation for the resultant stress in the weld lines of an eccentric welded connection when it is subjected to a moment. (06)

(B) A single riveted double cover butt joint in a structure is used for connecting two plates 15 mm thick. The diameter of the rivet is 25 mm. The permissible stresses are 125 N/mm^2 in tension, 90 N/mm^2 in shear and 180 N/mm^2 in crushing. Draw neat sketch of the joint and calculate the necessary pitch and efficiency of joints. (06)

5 (A) By using Macaulay's method, Determine the maximum slope and deflection of a simply supported beam carrying udl load. (06)

(B) A Simply supported rectangular R.C. beam of length 3m and cross-section 100 mm X 250 mm is subjected to a central point load of 15 KN. Find the maximum slope and deflection of the beam. Find the point load that can be placed centrally on the beam to cause a central deflection of 20 mm. Take E = 2 X 104 N/mm^2 (05)

OR

5 (A) Differentiate between a thin cylinder and a thick cylinder. Find an expression for the radial pressure and hoop stress at any point in case of a thick cylinder. (06)

(B) A cylindrical shell 3 m long which is closed at the ends has an internal diameter of 1 m and a wall thickness of 15mm. Calculate the circumferential and longitudinal stresses induced and also change in the length and diameter if it is subjected to an internal pressure of 1.5 MN/m^2. (05)

Take E=200GN/m2 and 1/m= 0.3

6 (A) Prove that the torque transmitted by a solid shaft when subjected to torsion is given by $T= (\pi/16) \times fs \times d3$. And what is torsional rigidity? (06)

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6 (B) An 80 mm diameter safely value is design to blow off at a gau pressure of 0.8N/mm^2. The wall is held by a close coiled helical spring of mean coil diameter 180mm. The initial compression being 15mm. Find the diameter of the spring rod and the number of coils required if the allowable shear stress is 75N/mm^2. Take N= 8x 104N/mm^2

"END OF PAPER"

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