Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM-3RD (ME/MC) REGULAR EXAMINATION– NOV-DEC 2015

2CI311: STRENGTH OF MATERIAL

TIME: 3 HRS **TOTAL MARKS: 60**

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.

(2) Figures on right indicate marks.

(3) Be precise and to the point in answering the descriptive questions.

(4) Assume suitable data whenever necessary.

SECTION: I

Q.1 A A simply supported beam AB of span 5m subjected to point load 125kN at point D, which is 1.75m away from right-hand side support. It is also subjected to 525KNm anticlockwise moment at point C, which is at center of beam. Uniformly distributed load of 75kN/m is also acting on beam starting from left support to center of beam. Draw the shear force and bending moment diagram and also show location of point of contra flexure. **(10)**

Q.2 A A cantilever beam 3 m long has a T-section. Flange is 90 mm wide & 20 mm thick. Web is 30mm thick. Overall depth of T-section is 60 mm. It carries a load of 1000 N at the free end. Calculate the maximum tensile and compressive stresses in the beam. Also draw bending stress diagram. **(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 × 300 mm. The section carries a shear force 120 KN. Determine maximum shear stress value and draw shear stress distribution diagram. **(05)**

OR

Q.2 A Compare the moment of resistance of two sections made from same materials and having same cross-sectional area. One is having circular cross-section having 300 mm diameter and other is having square cross-section. **(05)**

B Draw shape of shear distribution diagram for beams having following cross sections under a shear force 'S'. (1) Rectangular shape (2) T shape (3) plus (+) shape (4) Circular shape (5) I-shape **(05)**

Q.3 A A rectangular column of width 200 mm and of thickness 150 mm caries a point load of 240kN.Determine the maximum and minimum stress on the section & plot the stresses along the width, if eccentricity of load from center of column along X direction are a) 10 mm & b) 50 mm. **(05)**

B The stresses at a point in a component are 150MPa (Tensile) and 50MPa (Compressive). Determine the magnitude of the normal and shear stresses on a plane inclined at an angle of 35° with compressive stresses. **(05)**

OR

Q.3 A Prove that for no tension at the base of a short column of rectangular section, the line of action of the load should be within middle third **(05)**

B At a point in a strained material, the principal stresses are 100 MPa and 50 MPa both tensile. Find the normal and shear stresses at a section inclined at 60° with the axis of major principal stress. **(05)**

SECTION: II

Q.4 A A hollow cylinder 4m long has outside and inside diameters of 75 mm and 60 mm respectively. Find the stress and deformation of the cylinder, when it is carrying an axial tensile load of 50 kN. Take E = 200GPa. **(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 75 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 $\alpha = 12 \times 10\text{-}6/K$. **(05)**

Q.5 A A beam of uniform rectangular section 100 mm wide and 240 mm deep is simply supported ends. It carries a uniformly distributed load of 9.125 KN/m run over the entire span of 4m. Find the deflection at the centre if $E = 1.1 \times 10^4 N/mm^2$ **(05)**

B Derive an expression for the slope and deflection of a simply supported beam, carrying a load W at the centre with double integration method. **(05)**

OR

Q.5 A A beam of length 10 m is simply supported at its ends and carries point loads of100kN and 60kN at a distance of 2 m and 5 m respectively from the left support. Calculate the deflections under each load. Take $=18 \times 10^8 mm^4$ and $E= 2 \times 10^5 N/mm^2$.Use Macaulay's method. **(05)**

B Determine: deflection under the load and maximum deflection of a simply supported beam of length 10 m, which is carrying a point load of 10KN at a distance 6 m from the left end. Take $E = 2 \times 10^5 MPa$ and $I = 1 \times 10^8 mm^4$ **(05)**

Q.6 A Design a Double riveted Double cover butt joint for main plates 12 mm thick; using 20mm diameter bolt &100mmpitch.Assume thickness of cover plate is 6mm. **(05)**

(i) Calculate the efficiency of the joint

(ii) Strength of joints

The permissible stresses are : 6t = 100MPa, 6s = 70MPa, 6c = 160MPa

B A hollow shaft 50 mm external diameter and 30mm internal diameter , 0.7 m long is subjected to a twisting moment of 1200 Nm. Calculate the shear stress and the angle of twist. **(05)**

Take G = 90GPa.

OR

Q.6 A A Plate 100 X 10mm is welded to Gusset plate 200 X 12mm using size of fillet weld 6mm. Use weld stress 100MPa.Calculate strength of fillet weld. **(05)**

B Derive the torsion equation: $T/J=G\theta/L=\tau/R$ **(05)**

END OF PAPER