Exam No: _____

GANPAT UNIVERSITY

B. TECH SEM-3RD (CIVIL) REGULAR EXAMINATION– NOV-DEC 2015

2CI302: MECHANICS OF STRUCTURES

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 An overhanging having beam of span 4m simply support at left end and roller support at 3m from left end, is carrying uniformly distributed load of 12kN/m on 2m length from left support, a point load of 10kN inclined at 30^0 acting at 2m from left support, moment of 3kNm clockwise at same point. Draw the S.F. and B.M. Diagram. (06)

B A Uniformly distributed load of 10 kN/m load is applied on entire span of simply supported beam length of 4 m. Draw the shear force and bending moment diagram and show all the important values. (04)

Q.2 A What do you mean by 'simple bending' or 'pure bending'? What are the assumptions made in the theory of simple bending? (02)

B Figure 1 show the section of a beam which is loaded in the vertical plane of symmetry. Thickness of channel section is 50 mm. (06)
(a) The maximum stress is σ_m, determine the maximum B.M.
(b)If the bending stress at a point A in a section is 40 MN/m^2, what is B.M. at this section?

C Shown that for a rectangular section of the maximum shear stress is 1.5 times the average stress. (02)

OR

Q.2 A What do you understand by neutral axis and moment of resistance? (03)

B Compare the moment of resistance of a beam of square cross section of 200 mm × 200 mm when it is placed with its,(i)Sides horizontal and (ii)Diagonal horizontal (05)

C Draw shape of shear distribution diagram for beams having following cross sections under a shear force 'S'.(1) Circular shape (2) Channel 'C' shape (3) Inverted Tee (⊥)shape (4) Hollow rectangular shape. (0

Q.3 A A simply supported timber beam 150 mm wide × 300 mm deep is simply supported over a span of 4.5 m. it is loaded with a uniform load of 8 KN/m. Compute : (1) shear stress developed on a layer 60 mm above the neutral axis of a section located at 1.5 m from the left support. (2) Maximum shear stress on the above section. (3) Maximum shear stress anywhere in the beam. (05)

B A rectangular column of width 200 mm and of thickness 150 mm caries a point load of 240 kN. Determine the maximum and minimum stress on the section & plot the stresses along the width. if eccentricity of load at x axis are (a) 10 mm & (b) 50 mm. (05)

OR

Q.3 A A T-beam is simply supported having a point load of 100 KN at midspan. Flange & Web thicknesses are 100 mm. Flange and Web are 500 mm and 300 mm long respectively. Overall depth of T-section is 400 mm. Draw shear stress distribution diagram across the section at point of maximum shear force, including values at all important points. (05)

B A small concrete dam, trapezoidal in cross section with on face vertical, is 8 m high, 1.5m wideat top and 3.2 m wide at base. If it has to retain water up to depth 7.5m. Find maximum and minimum stresses generated at base and also sketch stress distribution diagram under the base of the dam. Consider unit weight of concrete and water as 25 kN/m^3 and 10 kN/m^3 respectively. (05)

SECTION:II

Q.4 A A brass bar having a cross sectional area of 1000 mm^2 is subjected to axial forces as Shown in figure 2. Find the total change in length of the bar. Take E = 105 GPa (05)

B Find out the force in the member BC and ED of truss as shown in figure 3. Using method of section. (05)

Q.5 A An alloy bar 2 m long is held between two supports. Find the stresses developed in the bar, when it is heated through 30 K if both the ends (i) do not yield (ii) yield by 1 mm. Take the value of E and α for the alloy as 120 GPa and 24 x 10^{-6} / K respectively. (05)

B Find out the force in the member BC and ED of truss as shown in figure 3. Using method of joint. (05)

OR

Q.5 A A hollow cast iron column having internal diameter 0.7*external diameter. If the length of this column is 6m and both of its ends are fixed, and it can carry safe load 300 kN with factor of safety 4. Determine minimum diameter of column with Rankine's formula. Take $f_c = 550\ N/mm^2$ and a = 1/1600 in Rankine's formula. (05)

B Find out the force in the member BC and ED of truss as shown in figure 4. Using method of joint. (05)

Q.6 A At a point in a strained material is subjected to a tensile stress of 120 MPa and a clockwise shear stress of 40 MPa. What are the values of normal and shear stresses on a plane inclined at 25° with the normal to tensile stress by analytical method. (06)

B Derive the expression for torque. (04)

OR

Q.6 A 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 using graphical method. (06)

B A shaft is made from tube. The ratio of the inside diameter to the outside diameter is 0.6. The material must not experience a shear stress greater than 65 MPa. The shaft must transmit 337.5 kW of mechanical power at 100 r.p.m. Assume that the maximum torque is 1.3 times mean. Calculate the shaft diameters. (04)

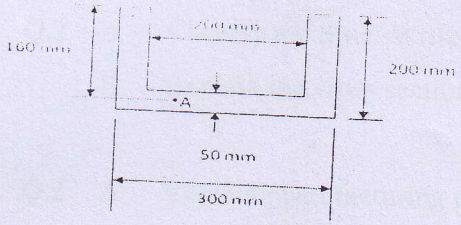

Figure: 1 Q: 2(B)

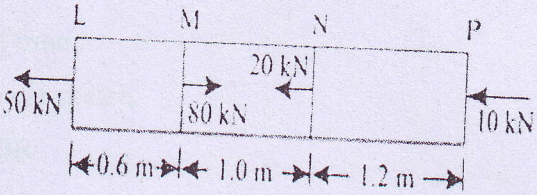

Figure: 2 Q: 4(A)

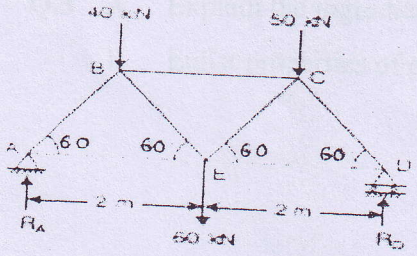

Figure: 3 Q: 4(B) & Q: 5(B)

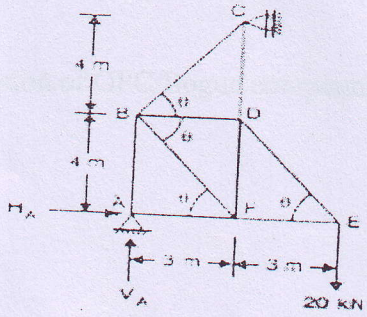

Figure: 4 OR Q: 5(B)

END OF PAPER