Code No: RR210102 **Set No. 1**

II B.Tech I Semester Supplementary Examinations, November 2006
STRENGTH OF MATERIALS-I
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the following : -
   (a) Working stress
   (b) Factor of safety
   (c) Volumetric strain
   (d) Poisson's ratio. [4+4+4+4]

2. A weight of 210 kN is supported by three short pillars each of sectional area 500 mm^2. The central pillar is of steel and the outer ones are of copper. The pillars are so adjusted that at a temperature of 15^0 C each carries equal load. The temperature is then raised to 950C. Find the stress in each pillar at 15^0C and 95^0 C. Take E_s = 200 GPa and E_C = 80 GPa $\alpha_s = 12 \times 10^{-6}$ / ^{0}C and $\alpha_c = 18 \times 10^{-6}$/ ^{0}C. [16]

3. Calculate the end reactions and draw the S.F. & B. M. diagram for the beam loaded as shown in Figure 3. Calculate magnitude & location of maximum B. M. [16]

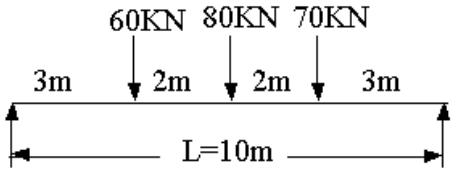

Figure 3

4. Design the cross section for a beam acted upon by a bending moment = 50 KNm. If width of beam is 200 mm calculate, depth. f = 9 N/mm^2. [16]

5. Figure 5 shows a cantilever truss ABCDE, subjected to a vertical load P = 100 KN at joint D. Determine the forces in the members and reactions at the supports. [16]

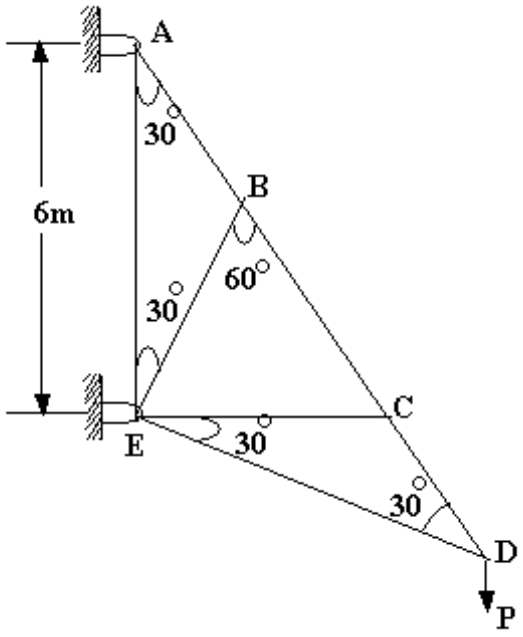

Figure 5

6. Derive the expression for max. slope and deflection of a cantilever beam of length L, carrying uniformly distributed load of w/unit length by double integration method. [16]

7. A tie member has to transmit a pull of 300 kN. Design a butt Joint to connect it with 12mm thick plate. Also find the efficiency of the Joint. Sketch the Joint.[16]

8. (a) Define the terms
   i. Hoop strain
   ii. Longitudinal strain

   (b) A cylindrical air receiver for a compressor is 2 m in internal diameter and made of plates 15mm thick. If the hoop stress is not to exceed 90 N/mm^2 and the longitudinal stress is not to exceed 60 N/mm^2, find the maximum safe air pressure.

[6+10]

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Code No: RR210102 **Set No. 2**

II B.Tech I Semester Supplementary Examinations, November 2006
STRENGTH OF MATERIALS-I
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What do you understand by yielding, strain - hardening, neck formation and permanent set.
   (b) Find the minimum dia. of a steel wire with which a load of 4000 N can be raised so that the tensile stress in the wire may not exceed 130 N/mm^2 calculate the extension of the wire, if it is 3 m long. Take E = 200 GPa.

   [6+10]

2. Rails of 15 m length were laid on the track when the temperature was 20^0C. A gap of 1.8 mm was kept between two consecutive rails. At what max temperature the rails will remain stress free ? If the temperature is raised further by 15^0C, what will be the magnitude and nature of stresses induced in the rails? [16]

3. Construct the S. F. D & B. M. D for the simply supported beam shown in Figure 3 [16]

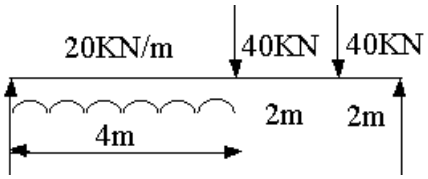

Figure 3

4. Calculate the section modulus for the I – section shown in Figure 4 and hence calculate maximum bending stress if the B. M = 50 KNm. [16]

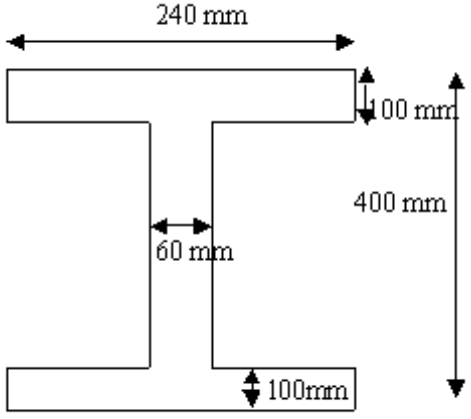

Figure 4

5. Determine the forces in the various members of a pin-jointed frame as shown in Figure 5 All loads are in kN. [16]

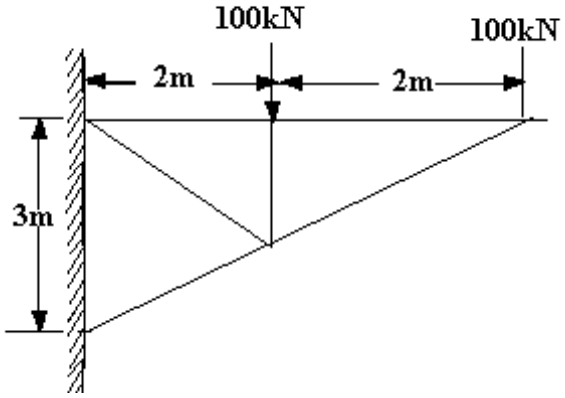

Figure 5

6. Derive the expression for max. slope and deflection of a cantilever beam of length L, carrying uniformly distributed load of w/unit length by double integration method. [16]

7. Determine the safe load and the efficiency of a double cover butt Joint. The main plates are 14mm thick connected by 18mm diameter rivets at a pitch of 100mm. Design the cover plates also. What is the percentage reduction in the efficiency of the Joint if the plates are lap Jointed. [16]

8. A cylindrical shell 1.2m long, 200mm internal diameter and 10mm thick is filled with a fluid at atmospheric pressure. If an additional 3 X 10^4 mm^3 of the fluid is pumped into the cylinder, find the pressure exerted by the fluid on the wall of the cylinder. Find also the hoop stress induced.

   Take E = 2 X 10^5 N/mm^2, $\mu = 0.3$. [16]

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Code No: RR210102 **Set No. 3**

II B.Tech I Semester Supplementary Examinations, November 2006
STRENGTH OF MATERIALS-I
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. A straight bar 60 cm long consists of three portions : the first 18 cm length is of 30 mm dia, the middle 26 cm length is of 20 mm dia. and the remaining 16 cm length is of 25 cm dia. if it is subjected to an axial pull of 100 kN find the total extension of the bar. Find also the stresses, strains and changes in length of different portions. Take E = 200 GPa. [16]

2. Rails of 15 m length were laid on the track when the temperature was 20^0C. A gap of 1.8 mm was kept between two consecutive rails. At what max temperature the rails will remain stress free ? If the temperature is raised further by 15^0C, what will be the magnitude and nature of stresses induced in the rails? [16]

3. (a) Define the "Beam" and the type of action and deformation it undergoes.
   (b) Draw the S.F. and B.M. diagram for a simply supported beam of span L m loaded with UDL of w KN/m. [6+10]

4. For a hollow circular section obtain the section modulus. Hence calculate the maximum bending stresses in a section external radius 300 mm and internal radius 180 cm, subjected to B. M = 50 KNm. [16]

5. Find the forces in all the members of the warrentype Cantilever truss shown in Figure 5 by the method of sections. Tabulate the values. [16]

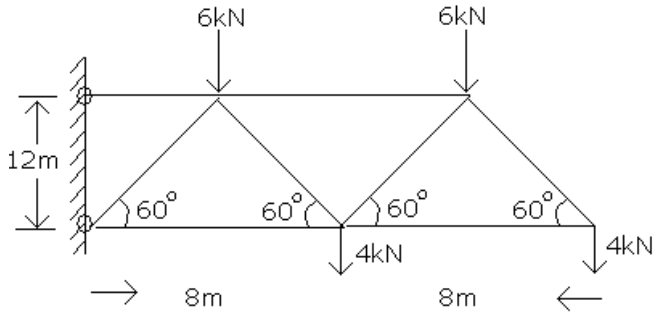

Figure 5

6. (a) Explain Macaulay's method.
   (b) Derive the expression for the slope and deflection of a cantilever beam of length L, carrying a point load W at the free end by double integration method. [8+8]

7. A member of a roof truss CARR covering 80 KN tensile force consists of two angle sections ISA 75×75×10mm placed back to back on both sides of a 10mm thick plate. Determine the power driven field rivets required for the joint , $\tau_s = 80N/mm^2$, $\sigma_v = 250N/mm^2$, $\sigma_t = 150N/mm^2$. [16]

8. (a) Define the terms
   i. Longitudinal stress
   ii. Volumetric strain

   (b) A boiler shell of 2m. diameter is made up of mildsteel plates of 20mm thick. The efficiency of the longitudinal and circumferential Joints is 70% and 60% respectively. Determine the safe pressure in the boiler, if the permissible tensile stress in the plate section through the rivets is 100 N/mm^2. Also determine the circumferential stress in the solid plate section and longitudinal stress through the rivets. [4+12]

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Code No: RR210102 **Set No. 4**

II B.Tech I Semester Supplementary Examinations, November 2006
STRENGTH OF MATERIALS-I
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the Poisson's ratio and Bulk modulus of a material whose modulus of elasticity is 200 GPa and modulus of rigidity is 80 GPa. A 2 m long rod of 40 mm dia. made with the same material is stretched by 2.5 mm under some axial load. Find the lateral contraction. [16]

2. A weight W falls by 30 mm on to a collar rigidly attached to the lower end of a vertical bar 3 m long and 1000 mm^2 in section. If the max. instantaneous extension is found to be 4 mm, find the max. stress produced and weight, if E = 200 GPa. [16]

3. Define point of Contra flexure. Draw the S.F.D. & B. M. D. for the following beam and find the maximum B. M. and locate the points of contra flexure (figure3). [16]

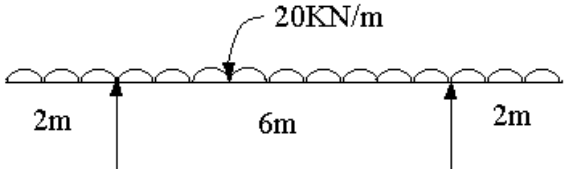

Figure 3

4. What do you understand by section-modulus? Obtain the dimensions of the strongest rectangular section that can be cut from a circular log of wood of 30 cm dia. [16]

5. (a) Explain the analysis of trusses using method of joints.
   (b) Determine the forces in all members of the truss shown in Figure 5 by method of sections. [8+8]

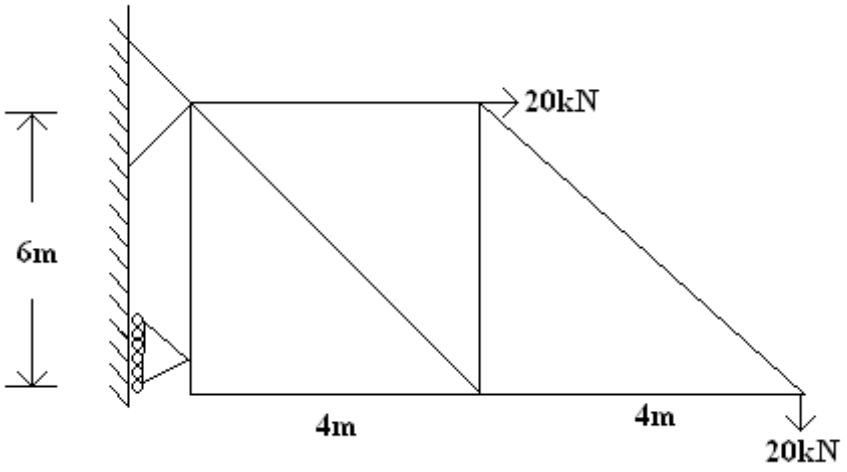

Figure 5

6. Write short notes on
   (a) Moment area method
   (b) Macaulay's method
   (c) Deflections of propped beams. [16]

7. (a) Sketch the following Joints.
      i. Single riveted lap Joint
      ii. Double riveted single cover butt Joint
      iii. Double riveted double cover butt Joint.
   (b) A double cover but Joint is used to connect plates 16mm thick. Design the riveted Joint and determine its efficiency. Use power driven rivetsw and take permissible stresses as per I.S. 800. [6+10]

8. A shell 3.25m. long, 1m in diameter is subjected to an internal pressure of $1N/mm^2$. If the thickness of the shell is 10mm, find the circumferential and longitudinal stresses. Also find out the maximum shear stress and the changes in the dimensions of the shell.
   Take E = 2×10^5 N/mm^2, $\mu = 0.3$. [16]

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