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

II B.Tech. I Semester Regular Examinations, November -2005
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. State Hooke's law. Sketch the stress- strain diagram for a ductile material like mild steel tested under tension upto destruction, marking the salient points on it. Explain the significance of each point. [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. (a) State the assumptions made in the theory of simple bending.
   (b) Derive the simple bending equation. [6+10]

5. Determine the forces in all the members of the pin jointed frame shown in figure 1. [16]

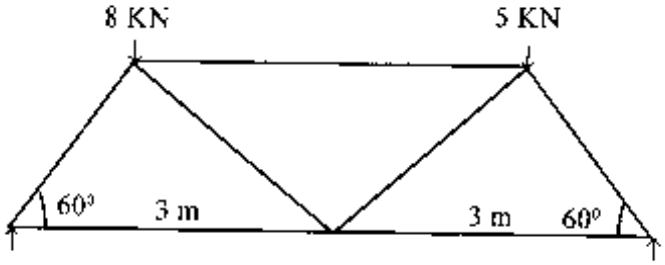

Figure 1:

6. (a) Explain the Mohr's theorems, for finding the slope and deflection of a beam.
   (b) A simply supported 6m rolled steel joist carries a U.D.L of 10 KN/m length. Determine slope and deflection at a distance of 3m from one end of the beam. [6+10]

7. (a) State the assumptions in the theory of riveted joints.

(b) A single riveted lap joint used to connect plates of 12mm thick. If 22mm diameter power driven field rivets are used at 75mm, determine the strength of the joint and the efficiency. [6+10]

8. Define the terms:

(a) Circumferential stress

(b) Longitudinal stress and derive the expressions for the same in thin cylinders. [16]

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1. Sketch the stress - strain diagram for a brittle material marking the salient points on it. How is this curve different from that of a ductile material. Explain the procedure of obtaining the yield stress of materials not having a well defined yield point. [16]

2. A steel rail 10 m long is in the unstressed condition at 10^0 C. If the temperature of the rail is increased to $60\ ^0$ C, find the stress induced if there is no provision for the expansion of the rail. If there is a gap of 5 mm what will be the change in stress, given E = 200 GN/ m^2 & a = $12 \times 10^{-6}/\ ^0$C. [16]

3. (a) What are the different types of beams possible describe the behavior of each of them.
   (b) Draw the S. F. and B.M. diagrams for a cantilever with a point load at the free end and u.d.l throughout. [6+10]

4. Derive an expression for the distribution of shear stress across the cross section. How is average shear stress defined. Relate maximum shear stress to the average shear stress in a rectangular section. [16]

5. Explain the analysis of trusses by
   (a) Method of joints
   (b) Method of sections
   (c) Tension coefficient method. [16]

6. A cantilever of 4m span length carries a load 40 KN at its free end. If the deflection at the free end is not to exceed 8mm, what must be the moment of inertia of the Cantilever section? [16]

7. (a) Describe the modes of failures of riveted joints with sketches?
   (b) A double cover butt joint is used to connect plates of 12mm thick. Using Unwin's formula determine the diameter of the rivet, rivet value, pitch and efficiency of the joint. [16]

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 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 Regular Examinations, November -2005
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 flat steel bar 30 mm wide and 5 mm thick is placed between two bars of aluminum, each 30 mm wide and 8 mm thick to form a compound bar at 10^0C. Calculate the temperature stresses induced at 55^0 C taking $E_s = 20^0$ GPa, $E_a = 67$ GPa, $\alpha_S = 12 \times 10^{-6}/\ ^0$C and $\alpha_a = 24 \times 10^{-6}/\ ^0$C. [16]

3. (a) Define Bending moment, Shear Force and point of Contra flexure.
   (b) Draw the S. F. D & B.M.D. for the beam shown in Figure 2. [6+10]

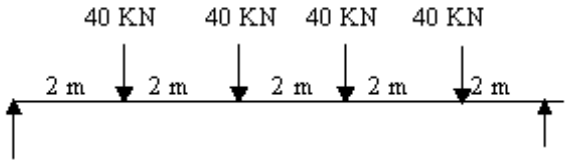

Figure 2:

4. Define section modulus. Obtain section modulus for rectangular and circular sections. Write the expression for stresses in terms of section modulus and B.M. [16]

5. (a) What is degree of in determinancy in trusses? Explain with examples?
   (b) Explain method of tension coefficients, and explain why it is preferred to analyse the trusses ? [8+8]

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

7. Determine the strength of the double cover butt joint to connect two flats 150ISF12. The thickness of each cover plate is 8mm. Flats have been joined by 22mm diameter power driven rivets of 6 in two rows by chain riveting. The distance between center of rows and rivets is 75mm and edge distance is 40mm. What is the efficiency of the joint. [16]

8. (a) Define the terms:
   i. Hoop stress
   ii. Longitudinal stress and
   (b) Derive the expressions for the same in thin spherical shells. Also obtain the expressions for change in diameter and volume. [6+10]

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

II B.Tech. I Semester Regular Examinations, November -2005
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. Determine the changes in length, width and thickness of a steel bar 50 mm long, 25 mm wide and 15 mm thick if it is subjected to an axial pull of 40 kN. Take E = 200 GPa and Poissons ratio = 0.3. [16]

2. A thin tyre is shrunk on a wheel of 1 m dia. Find the internal diameter. of the tyre, if the circumferential stress is limited to 90 N/ mm^2. Find also the least temperature to which the tyre must be heated above that of the wheel, before it could be slipped on. For the tyre material take E = 200 GPa and $\alpha = 12 \times 10^{-6}/{}^0C$. [16]

3. Construct the S. F. D and B. M. D for the cantilever beam shown Figure 3. [16]

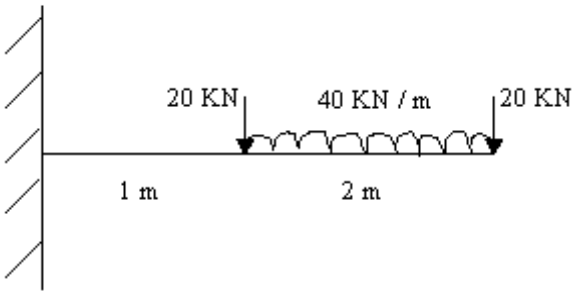

Figure 3:

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. Determine the forces in all the members of the truss shown in (figure4) by method of joints. [16]

6. A 6.5 m long Cantilever carries a uniformly distributed load over the entire length. If the slope at the free end is 1^0 (one degree) what is the deflection at the free end. [16]

7. (a) Explain the different types of Riveted Joints.

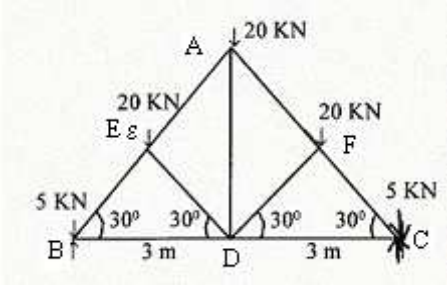

Figure 4:

(b) A double riveted double cover butt Joint to connect plates 16mm thick is made with 20mm rivets at 80mm pitch. Calculate the pull per pitch length at which the Joint will fail and also its efficiency.
Take $f_t = 480$ N/mm^2, $f_b = 760$ N/mm^2 and $f_s = 380$ N/mm^2. [8+8]

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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