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

**II B.Tech. I Semester Supplementary Examinations, May -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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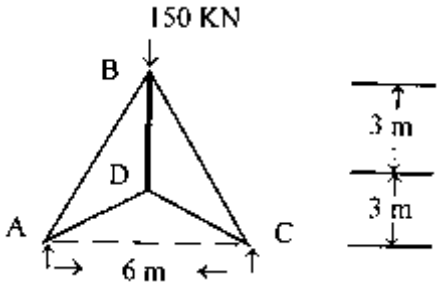
1. Explain the Following:
   (a) Elasticity and Plasticity
   (b) Ductility and Malleability
   (c) Stress and Strain
   (d) Limit of proportionality and Elastic Limit
2. Rails of 15 m length were laid on the track when the temperature was $20^0$C. A gap f 1.8 mm was kept between two consecutive rails. At what max temperature the rails will remain stress free? If the temperature is raised further by $15^0$C, what will be the magnitude and nature of stresses induced in the rails?
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.
4. (a) With usual notation derive the bending equation: $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$
   (b) State the assumptions made in the theory of simple bending.
5. Analyse the frame shown in figure and tabulate the forces in the members. AC is not a member.




6. A steel girder of uniform section is 14 m long and is simply supported at the ends. It carries concentrated loads of 100KN and 80 KN at 4m and at 8m from the left end. Calculate the deflection under the point loads and the maximum deflection in the girder. Take I = 60 x $10^{-4}m^4$ and E = 200 x $10^6 KN/m^2$.

7. In a truss girder of a bridge, a diagonal consists of a 16 mm thick flat and carries a pull of 750 kN and is connected to a gusset plate by a double cover butt Joint. The thickness of each cover plate is 8mm. Determine the number of rivets necessary and the width of the flat required. What is the efficiency of the Joint. Sketch the Joint. Use power driven rivets and take permissible stresses as per I.S. 800.

8. (a) Define the terms:
   i. Hoop stress
   ii. Maximum shear stress.
   (b) Calculate the increase in volume enclosed by a boiler shell 2.4 m long, and 1m. in diameter, when it is subjected to an internal pressure of 2 N/$mm^2$. The wall thickness is such that, the maximum tensile stress in the shell is 25 N/$mm^2$ under this pressure. Take E = 2 X $10^5 N/mm^2, \mu = 0.25$

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

**II B.Tech. I Semester Supplementary Examinations, May -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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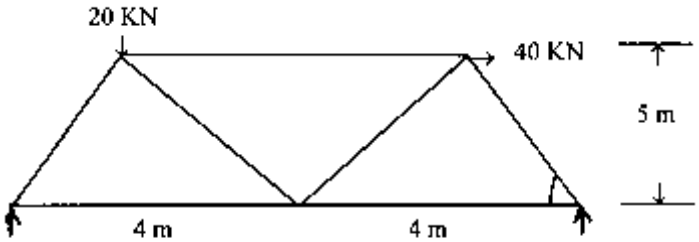
1. A specimen of material having 12mm dia. is tested under tension over a gauge length of 50mm. At 20kN load the extension was 0.035mm. The max. load taken by the specimen was 60kN and the fracture occurred at 40kN. Find the modulus of elasticity, ultimate strength, breaking strength and percentage elongation, if the final length of the specimen was 70mm.

2. A uniform metal bar of 1.5 m length, area of section 600 $mm^2$ has an elastic limit of 160 N $/mm^2$. Find its proof resilience, if E = 200 Gpa. Find also the max. applied load which can be suddenly applied without exceeding the elastic limit. Calculate the magnitude of the gradually applied load which will produce the same extension.

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.

4. For a circular section of diameter d, subjected to an S.F.(F) obtain the shear stress distribution and maximum & average shear stress.

5. Determine the forces in various members.




6. A simply supported beam of Span 6 m is subjected to a point load of 100 KN placed at 4m from the left support. Find the position and amount of maximum deflection.

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.

8. A cylindrical shell 3m long has 1m. internal diameter and 15mm metal thickness. Calculate the circumferential and longitudinal stresses induced and find out the changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.5 N/mm2. Also find out the maximum shear stress. Take E = $2X10^5 N/mm^2$, $\mu$ = 0.3.

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

**II B.Tech. I Semester Supplementary Examinations, May -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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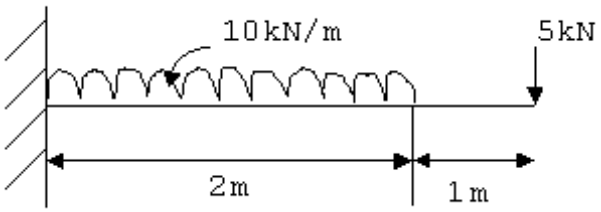
1. A rigid platform rests on two aluminium bars each of C.S.A. 50 sq. mm and length 250 mm. In the middle there is another steel bar of same length but different C.S.A. of 100 sq. mm. If a load of 100 kN is placed on the platform, calculate the stresses induced in each bar and the reduction in their lengths, if $E_S$ = 200 GPa and Ea = 100 GPa.

2. Two rods of same length and same material are subjected to the same axial load. The first rod is of uniform dia. D. The second bar has a dia. D for 1/3 of its length and 2D for the remaining length. Compare the strain energies of the two bars.

3. Construct the S. F. D. and B. M. D. for the cantilever beam shown and identify the maximum values for each.




4. For triangular section (b x h) subjected to a S.F. (F), obtain the shear stress distribution. Mark the salient values.

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

6. A Cantilever of length L carries a uniformly distributed load of w per unit run over the whole length. If the free end be supported over a rigid prop, find the reaction of the prop and sketch S.F and B.M diagrams. Find also the maximum deflection.

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.

8. (a) A steel cylinder 240mm internal diameter is to withstand an internal pressure of 5N/$mm^2$. The increase in area of the bore due to the resulting radial expansion is limited to 0.1% of the nominal area. Calculate the necessary thickness of the cylinder and the circumferential stress induced in the section. Take E = $2X10^5 N/mm^2, \mu = 0.3$.

   (b) A long boiler tube has to withstand an internal pressure of 6N/$mm^2$. The internal diameter of the tube is 60 mm. Determine the thickness and mass/m of the tube if the circumferential stress is not to exceed 130 N/$mm^2$. Mass density of steel is 7850 kg/$m^3$.

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

**II B.Tech. I Semester Supplementary Examinations, May -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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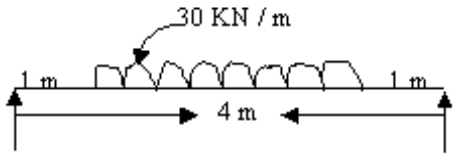
1. (a) What do your understand by volumetric strain and Bulk modulus ?
   (b) During a direct tension test on a 20 mm dia. rod 1 m long, the longitudinal strain was observed to be 4 times the lateral strain. If its elastic modulus is 200 GPa, find the Bulk modulus and Rigidity modulus. If the rod is subjected to a hydrostatic pressure of 100 N/$mm^2$, find the decrease in volume.

2. A wagon of weight 25 kN, attached to a wire rope, is moving at speed of 4 km ph. The cross sectional area of rope is 5 $cm^2$. Suddenly the rope jams and the wagon is brought to rest. If the length of the rope is 10 m at the time of sudden stoppage, find the instantaneous stress and elongation of rope if E = 200 Gpa. & g = 9.8 m/$sec^2$.

3. Construct the B. M. D. and S. F. D. for the Simply Supported beam shown in the fig below.




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.

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

6. A horizontal beam of uniform section is pinned at its ends which are at the same level and is loaded at the left hand pin with an anticlockwise moment M and at the right hand pin with a clockwise moment 2m both in the same vertical plane. The length between the pins is L. Find the angles of slope at each end and the deflection of the midpoint of the span in terms of M, L, E and I.

7. (a) Define the following terms:
      i. Gauge distance
      ii. Staggered pitch
      iii. Rivet line.

(b) Design a double cover butt Joint to connect two plates each 12mm thick. The load to be transferred by the Joint is 400 kN.

8. (a) A cylindrical shell with internal diameter 60mm and having a thickness equal to 3 mm is made of mildsteel. Determine the permissible internal fluid pressure if the factor of safety on maximum shear stress is 4.

(b) A cylindrical shell of 80mm internal diameter and 1.2mm thick is closed at the ends and subjected to an internal fluid pressure so that the maximum hoop stress in the tube is 120 N/$mm^2$. Determine the percentage increase in the capacity of tube. Take E = $2X10^5 N/mm^2, \mu = 0.3$.

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