Code No: RR10802 **RR** **Set No. 2**

I B.Tech Examinations,December 2010
STRENGTH OF MATERIALS
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is 'elastic section modulus'?
   (b) A rolled steel joist of I section has dimensions as shown in Figure 1b. This beam of I section carries a u.d.l of 50 kN/m on a simply supported span of 10m. Calculate the stresses produced due to bending. [4+12]

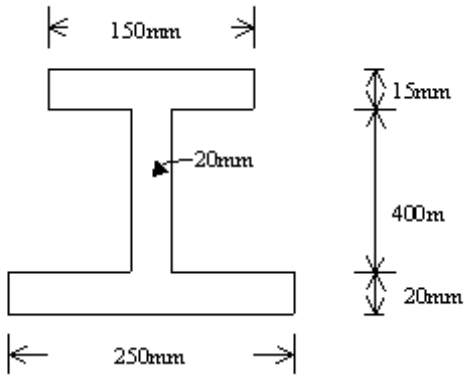

Figure 1b

2. A hollow shaft of diameter ratio 3/8 is to transmit 375 kW at 100 rpm, the maximum torque being 20% greater than the mean; the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 4 metre is not to exceed 2 degrees. Calculate its external and internal diameters, which would satisfy both the above conditions. Take C = 8 * 10^4 N/mm^2. [16]

3. (a) What is 'point of contra flexure'.
   (b) Draw shear force and bending moment diagrams and mark the salient values. {As shown in the Figure 3b}. [4+12]

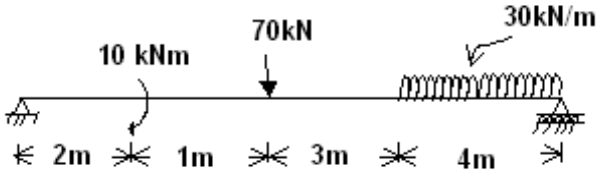

Figure 3b

4. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F at a section. Find the maximum shear in the cross section of the beam and draw the shear distribution diagram for the section. [16]

5. (a) What is a homogeneous and isotropic material. Define stress and strain.
   (b) What is Hooke's law and hence define modulus of elasticity. What is factor of safety.
   (c) A steel tube 35 mm internal diameter, 2.5 mm thick and 5 m long is covered throughout with copper tubes of 2.5 mm thick. The tubes are rigidly fastened at their ends. The compound tube is subjected to tension and the stress produced in steel is 75 MPa. Determine
      i. the elongation of the steel tube.
      ii. Stress in copper tube and
      iii. the load carried by the combined tube. Take $E_{steel} = 2 \times 10^5$ MPa and $E_{copper} = 1.1 \times 10^5$ MPa. [4+4+8]

6. A cylindrical shell 2.7m long has 1.2m internal diameter and 16mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.4N/mm^2. Take E = 2×10^5 N/mm^2 and poisson's ratio = 0.28. [16]

7. (a) Show that in a strained material subjected to two-dimensional stress, the sum of the normal components of stresses on any two mutually perpendicular planes is constant.
   (b) At a point in bracket the normal stresses on two perpendicular planes are 120 N/mm^2 tensile and 60 N/mm^2 tensile. The shear across these planes is 30 N/mm^2. Find using the Mohr's stress circle, the principal stresses and maximum shear at the point. [8+8]

8. (a) Define the terms modulus of elasticity and modulus of rigidity
   (b) A point in an elastic material is subjected to two mutually perpendicular stresses 80 MPa and 55 MPa both being tensile. Calculate the normal and tangential stresses on a plane making an angle of 40^0 with the axis of the second stress. [8+8]

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Code No: RR10802 **RR** **Set No. 4**

I B.Tech Examinations,December 2010
STRENGTH OF MATERIALS
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F at a section. Find the maximum shear in the cross section of the beam and draw the shear distribution diagram for the section. [16]

2. A cylindrical shell 2.7m long has 1.2m internal diameter and 16mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.4N/mm^2. Take E = 2 × 10^5 N/mm^2 and poisson's ratio = 0.28. [16]

3. (a) What is 'elastic section modulus'?
   (b) A rolled steel joist of I section has dimensions as shown in Figure 3b. This beam of I section carries a u.d.l of 50 kN/m on a simply supported span of 10m. Calculate the stresses produced due to bending. [4+12]

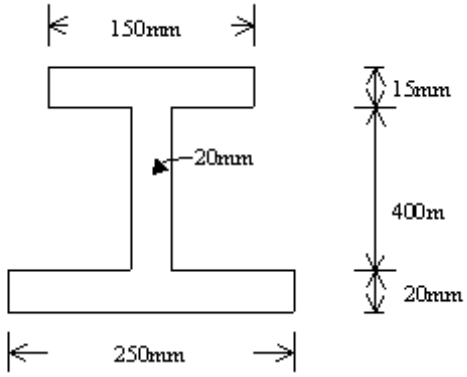

Figure 3b

4. (a) Show that in a strained material subjected to two-dimensional stress, the sum of the normal components of stresses on any two mutually perpendicular planes is constant.
   (b) At a point in bracket the normal stresses on two perpendicular planes are 120 N/mm^2 tensile and 60 N/mm^2 tensile. The shear across these planes is 30 N/mm^2. Find using the Mohr's stress circle, the principal stresses and maximum shear at the point. [8+8]

5. A hollow shaft of diameter ratio 3/8 is to transmit 375 kW at 100 rpm, the maximum torque being 20% greater than the mean; the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 4 metre is not to exceed 2 degrees. Calculate

its external and internal diameters, which would satisfy both the above conditions. Take C = 8 * 10^4 N/mm^2. [16]

6. (a) Define the terms modulus of elasticity and modulus of rigidity
   (b) A point in an elastic material is subjected to two mutually perpendicular stresses 80 MPa and 55 MPa both being tensile. Calculate the normal and tangential stresses on a plane making an angle of 40^0 with the axis of the second stress. [8+8]

7. (a) What is 'point of contra flexure'.
   (b) Draw shear force and bending moment diagrams and mark the salient values. {As shown in the Figure 7b}. [4+12]

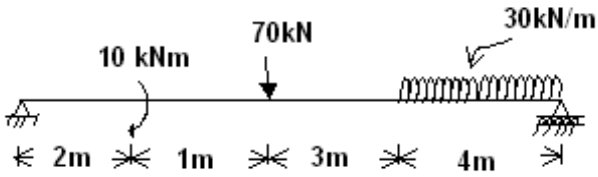

Figure 7b

8. (a) What is a homogeneous and isotropic material. Define stress and strain.
   (b) What is Hooke's law and hence define modulus of elasticity. What is factor of safety.
   (c) A steel tube 35 mm internal diameter, 2.5 mm thick and 5 m long is covered throughout with copper tubes of 2.5 mm thick. The tubes are rigidly fastened at their ends. The compound tube is subjected to tension and the stress produced in steel is 75 MPa. Determine
      i. the elongation of the steel tube.
      ii. Stress in copper tube and
      iii. the load carried by the combined tube. Take $E_{steel} = 2 \times 10^5$ MPa and $E_{copper} = 1.1 \times 10^5$ MPa. [4+4+8]

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Code No: RR10802 **RR** **Set No. 1**

I B.Tech Examinations,December 2010
STRENGTH OF MATERIALS
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Show that in a strained material subjected to two-dimensional stress, the sum of the normal components of stresses on any two mutually perpendicular planes is constant.
   (b) At a point in bracket the normal stresses on two perpendicular planes are 120 N/mm^2 tensile and 60 N/mm^2 tensile. The shear across these planes is 30 N/mm^2. Find using the Mohr's stress circle, the principal stresses and maximum shear at the point. [8+8]

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   (b) What is Hooke's law and hence define modulus of elasticity. What is factor of safety.
   (c) A steel tube 35 mm internal diameter, 2.5 mm thick and 5 m long is covered throughout with copper tubes of 2.5 mm thick. The tubes are rigidly fastened at their ends. The compound tube is subjected to tension and the stress produced in steel is 75 MPa. Determine
      i. the elongation of the steel tube.
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      iii. the load carried by the combined tube. Take $E_{steel} = 2 \times 10^5$ MPa and $E_{copper} = 1.1 \times 10^5$ MPa. [4+4+8]

3. (a) What is 'elastic section modulus'?
   (b) A rolled steel joist of I section has dimensions as shown in Figure 3b. This beam of I section carries a u.d.l of 50 kN/m on a simply supported span of 10m. Calculate the stresses produced due to bending. [4+12]

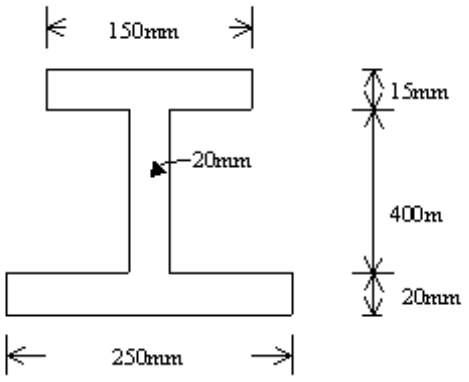

Figure 3b

4. (a) Define the terms modulus of elasticity and modulus of rigidity
   (b) A point in an elastic material is subjected to two mutually perpendicular stresses 80 MPa and 55 MPa both being tensile. Calculate the normal and tangential stresses on a plane making an angle of 40^0 with the axis of the second stress. [8+8]

5. A hollow shaft of diameter ratio 3/8 is to transmit 375 kW at 100 rpm, the maximum torque being 20% greater than the mean; the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 4 metre is not to exceed 2 degrees. Calculate its external and internal diameters, which would satisfy both the above conditions. Take C = 8 * 10^4 N/mm^2. [16]

6. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F at a section. Find the maximum shear in the cross section of the beam and draw the shear distribution diagram for the section. [16]

7. (a) What is 'point of contra flexure'.
   (b) Draw shear force and bending moment diagrams and mark the salient values. {As shown in the Figure 7b}. [4+12]

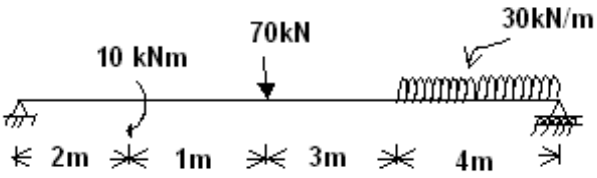

Figure 7b

8. A cylindrical shell 2.7m long has 1.2m internal diameter and 16mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of $1.4N/mm^2$. Take E = 2 × 10^5 N/mm^2 and poisson's ratio = 0.28. [16]

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Code No: RR10802 **RR** **Set No. 3**

I B.Tech Examinations,December 2010
STRENGTH OF MATERIALS
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A hollow shaft of diameter ratio 3/8 is to transmit 375 kW at 100 rpm, the maximum torque being 20% greater than the mean; the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 4 metre is not to exceed 2 degrees. Calculate its external and internal diameters, which would satisfy both the above conditions. Take C = 8 * 10^4 N/mm^2. [16]

2. (a) Define the terms modulus of elasticity and modulus of rigidity.
   (b) A point in an elastic material is subjected to two mutually perpendicular stresses 80 MPa and 55 MPa both being tensile. Calculate the normal and tangential stresses on a plane making an angle of 40^0 with the axis of the second stress. [8+8]

3. (a) Show that in a strained material subjected to two-dimensional stress, the sum of the normal components of stresses on any two mutually perpendicular planes is constant.
   (b) At a point in bracket the normal stresses on two perpendicular planes are 120 N/mm^2 tensile and 60 N/mm^2 tensile. The shear across these planes is 30 N/mm^2. Find using the Mohr's stress circle, the principal stresses and maximum shear at the point. [8+8]

4. A cylindrical shell 2.7m long has 1.2m internal diameter and 16mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.4N/mm^2. Take E = 2 × 10^5 N/mm^2 and poisson's ratio = 0.28. [16]

5. (a) What is 'elastic section modulus'?
   (b) A rolled steel joist of I section has dimensions as shown in Figure 5b. This beam of I section carries a u.d.l of 50 kN/m on a simply supported span of 10m. Calculate the stresses produced due to bending. [4+12]

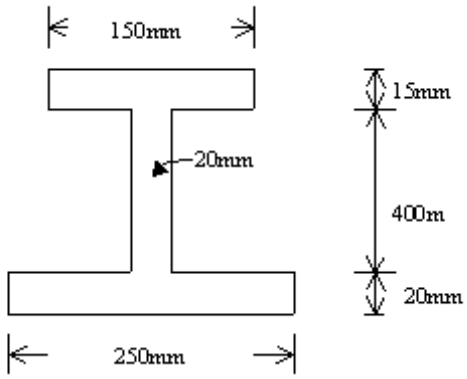

Figure 5b

6. (a) What is 'point of contra flexure'.
   (b) Draw shear force and bending moment diagrams and mark the salient values. {As shown in the Figure 6b}. [4+12]

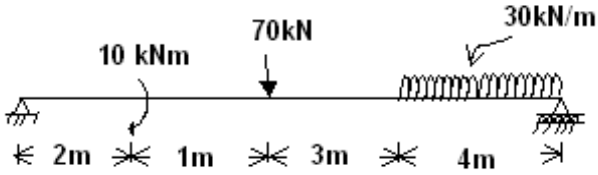

Figure 6b

7. (a) What is a homogeneous and isotropic material. Define stress and strain.
   (b) What is Hooke's law and hence define modulus of elasticity. What is factor of safety.
   (c) A steel tube 35 mm internal diameter, 2.5 mm thick and 5 m long is covered throughout with copper tubes of 2.5 mm thick. The tubes are rigidly fastened at their ends. The compound tube is subjected to tension and the stress produced in steel is 75 MPa. Determine
      i. the elongation of the steel tube.
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8. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F at a section. Find the maximum shear in the cross section of the beam and draw the shear distribution diagram for the section. [16]

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