B.Tech II Year - II Semester Examinations, April/May-2012
STRENGTH OF MATERIALS-II
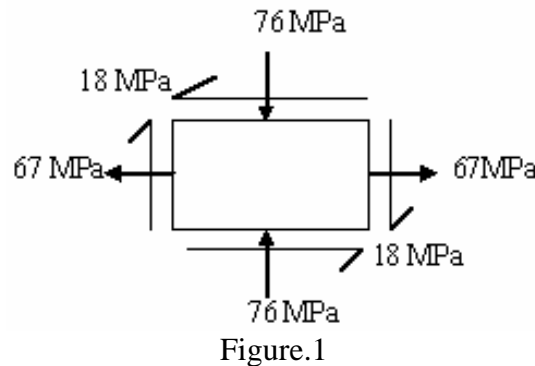**(CIVIL ENGINEERING)**

Time: 3 hours   Max. Marks: 80

Answer any five questions
All questions carry equal marks
- - -

1. A plane element is subjected to stresses as shown in Figure.1. Determine the Principal stresses, maximum shear stress and their planes. Use Mohr's Circle Mthod. [16]

Figure.1

2. A solid circular shaft is subjected to a bending moment of 66 kNm and a torque of 34 kNm. Design the diameter of the shaft according to:
   a) The Maximum Principal Stress Theory
   b) The Maximum Shear Stress Theory and
   c) The Maximum Distortion Energy Theory.
   Take Poisson's ratio = 0.29, the stress at elastic limit of the material is 275 MPa and the factor of safety=3.0. [16]

3.a) What is meant by 'Pure Torsion'?
  b) A hollow shaft of diameter ratio 3/8 is to transmit 385 kW at 106 rpm. The maximum torque being 26 % greater than the mean, the shear stress is not to exceed 64 MPa and the twist in a length of 6 m is not to exceed 2 degrees. Calculate its external and internal diameters which would satisfy both the above said conditions. Take $G=9.5 \times 10^4$ MPa. [16]

4. An Open Coiled spring made from steel wire of circular cross-section is to carry a load of 110 kN. The wire diameter is 8 mm and the mean coil radius is 46 mm. Calculate (a) the axial deflection, (b) the angular rotation of the free end with respect to the fixed end. The helix angle of the spring is 34° and the number of turns is 16. Assume $G=83$ kN/mm^2 and $E=206$ kN/mm^2. [16]

5. A hollow cast-iron column whose outside diameter is 260 mm and has a thickness of 20 mm is 5.2 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.8. Find the ratio of Euler's to Rankine's loads. Take $E_{cast\ iron} = 106$ GPa and Rankine's constant $= 1/1670$ for both ends pinned case and the crushing strength of the material as 575 MPa. [16]

6. A masonry retaining wall trapezoidal in section with one face vertical is 1 m wide at top and 3 m wide at the base and 9 m high. The material retained on the vertical face exerts a lateral pressure varying from zero at top to 27 kN/m^2 at the base. If the unit weight of the masonry is 20 kN/m^3, calculate the maximum and minimum stress intensities induced at the base. [16]

7.a) What is meant by thick cylinder? What is the important assumption made in the analysis of thick cylinders?

b) A thick cylindrical pipe of outside diameter 340 mm and internal diameter of 220 mm is subjected to an internal fluid pressure of 28 MPa and external fluid pressure of 7 MPa. Determine the hoop stress developed and draw the variation of hoop stress and radial stress across the thickness. [16]

8. A beam of rectangular section 180 mm wide and 260 mm deep is used over a simply supported span of 6.8 m to support two concentrated loads of 7 kN each at 3 m from either support. The plane of loads makes an angle of 34° with the vertical plane of symmetry. Find the direction of the neutral axis and the maximum bending stresses in the beam. [16]

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76 MPa

18 MPa

67 MPa ← → 67MPa

18 MPa

76 MPa

Figure.1
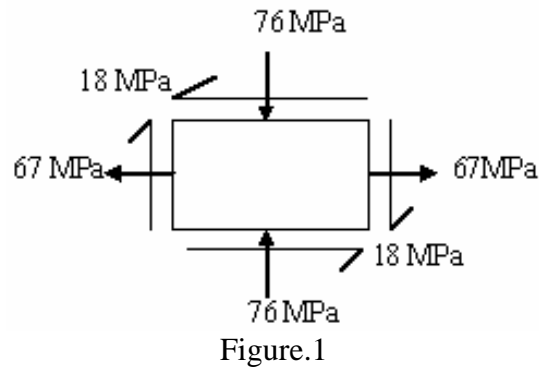
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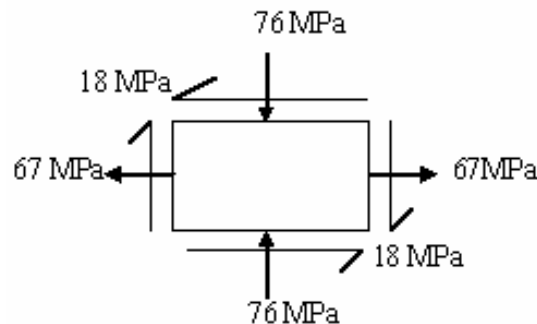

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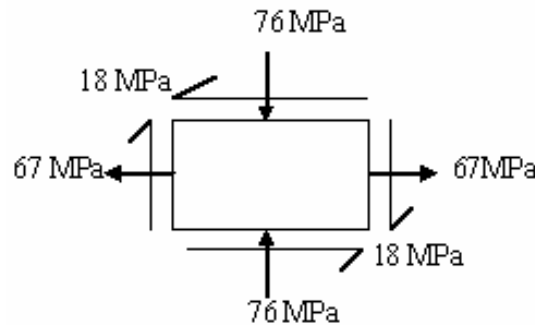

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