

**R15**

Code No: 123AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2017

MECHANICS OF SOLIDS

(Common to ME, MCT, MMT, AE, AME, MSNT)

Time: 3 Hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

**PART-A****(25 Marks)**

- 1.a) How shear deformation takes place. [2]
- b) Differentiate compressive and crushing stress. [3]
- c) What is the procedure adopted for calculating the shear force at a section. [2]
- d) In which case, the SFD is parabolic and BMD is cubic. [3]
- e) What is the section modulus of a rectangular and circular sections? [2]
- f) How the section modulus of a triangular section can be increased. [3]
- g) What are the various forces by which the mohr's circle is drawn. [2]
- h) What is the importance of Von Misses Theory? [3]
- i) What is the torsion of a tapering shaft? [2]
- j) How the cylinders are classified under thin and thick sections? [3]

**PART-B****(50 arks)**

2. In a triaxial stress system, the six components of the stress at a point are :  
 $\sigma_{xx}=6$  MPa,  $\sigma_{yy}=5$  MPa  $\sigma_{zz}= 4$  MPa  
 $\tau_{xy} = \tau_{yx}=1$  MPa,,  $\tau_{yz} = \tau_{zy}= 3$ MPa,  $\tau_{zx} = \tau_{xz}=2$  MPa.  
 Find the magnitude of the three principal stresses. [10]

**OR**

3. A hollow right circular cylinder is made of cast iron and has an outside diameter of 75 mm and an inside diameter of 60 mm. if the cylinder is loaded by an axial compressive force of 50 KN, determine the total shortening in a 600 mm length. Also determine the normal stress under this load. Take the modulus of elasticity to be 100 GPa and neglect any possibility of lateral buckling factor of the cylinder. [10]

4. A cantilever beam loaded by a concentrated load at the free end together with a uniform load distributed over the right half of the beam. Plot the shear and moment diagrams shown in figure 1. [10]

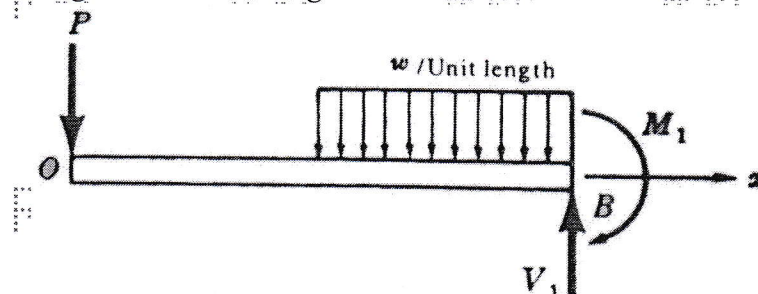


Figure: 1

OR

5. Draw the shear force and bending moment diagrams for the beam shown in figure 2. [10]

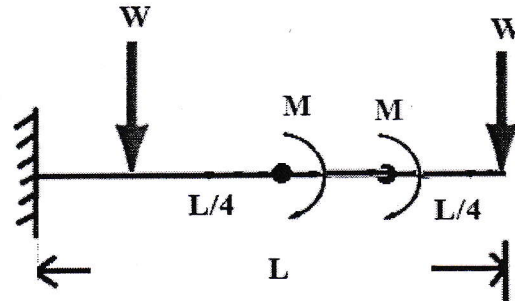


Figure: 2

6. A steel cantilever beam 8 m length is subjected to a concentrated load of 32 kN acting at the free end of the bar. The beam is of rectangular cross section, 50mm wide by 100 mm deep. Determine the magnitude and location of the maximum tensile and compressive bending stresses in the beam. [10]

OR

7. A cantilever beam is of length 1.5 m, loaded by a concentrated force P at its tip as shown in Figure 3 and is of circular cross section (R=100 mm) having two symmetrically placed longitudinal holes as indicated, the material is titanium alloy, having an allowable working stress in bending of 600 MPa. Determine the maximum allowable value of the vertical force P. [10]

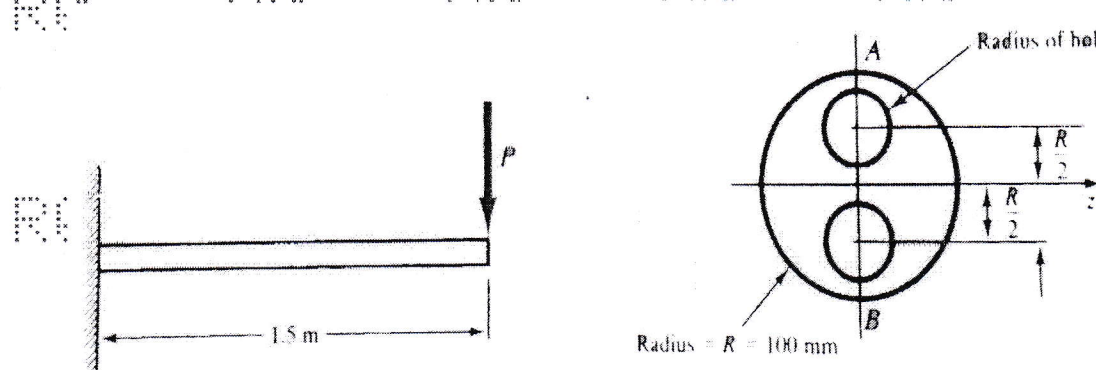


Figure: 3

8. A plane element is subjected to the stresses as shown in figure 4. Using Mohr's circle, determine (a) the principal stresses and their directions and (b) the maximum shearing stresses and the directions of the planes on which they occur. [10]

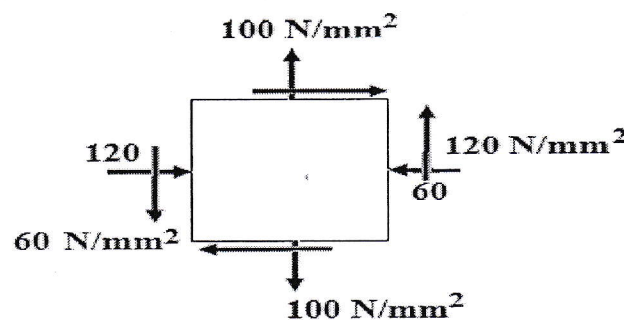


Figure: 4