Code No: 153BE

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, December - 2019
MECHANICS OF SOLIDS
(Common to ME, MCT, MIE)

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 as sub questions.

PART – A **(25 Marks)**

1.a) What is bulk modulus and mention its importance? [2]
b) What is the effect of varying loads on beams? [2]
c) What assumptions are made in the derivation of equation in simple bending? [2]
d) What is Mohr's circle? [2]
e) Why hollow shafts are more rigid than solid shafts? [2]
f) What is the effect of temperature on a bar with open and closed ends? [3]
g) What is the difference between couple and bending moments? [3]
h) How to improve load carrying capacity of beam? [3]
i) What is uni-axial stress? [3]
j) What is torsional stiffness of shaft? [3]

PART – B **(50 Marks)**

2.a) What is the importance of factor of safety?
b) A circular pipe of internal diameter 40 mm and thickness 5 mm is subjected to a force of 40 kN and elongation was measured as 1.5 mm. If the length of pipe is 2.5m. Find the value of Young's modulus and stress in the pipe. [2+8]

OR

3. A steel tube of outside diameter 300mm and thickness 12mm is 2.5m long and carries a load of 1200 kN. Find the change in length, outside diameter and thickness due to the tensile load. E = 200 GPa and poisson's ratio is 0.33. [10]

4. A cantilever of 4.5m length and carries of UDL of 25 kN/m for a length of 2m from free end and a concentrated load of 30 kN at free end. Draw B.M and S.F diagrams. [10]

OR

5. A simply supported beam of 6m span UDL of 25 kN/m over left half and a concentrated load of 30 kN at 1 m from right support. Draw B.M and S.F diagrams and find position and magnitude of maximum B.M in the beam. [10]

6. The stress system at a point is given by a normal stress of 100 N/mm^2(compressive) along the X-axis 60 N/mm^2 (Tensile) along Y-axis and a shear stress of – 50 N/mm^2 on the X-planes. Find the principal stresses and planes on which they act show the stresses and planes in a neat sketch. [10]

OR

7. A rectangular section 250 mm wide and 500 mm deep is used on a span of 8m for the loading of 'W' kN at 2 points 2m from left support and 2m from right support of simply supported beam. Find the maximum value of 'W' so that permissible stress of 60 MPa is not exceeded in the material. [10]

8.a) What are the causes of failure of beams and mention the remedial methods?
b) Derive an equation under maximum principal shear strain energy theory. [5+5]

OR

9. A hollow circular section of outside diameter 250mm and thickness 12mm carries SF of 30 kN. Find the maximum shear stress and the shear stress at the inner edge and draw the shear stress distribution diagram. [10]

10. A solid circular shaft of diameter 100mm has the angle of twist in a length of 2.5m, when the shaft is subjected to a torque of 12 kN-m. Find the maximum shear stress and angle of twist. Take G = 85 GPa. [10]

OR

11. A thin spherical shell of 1.5 m in diameter with its thickness of 1.25 cms, is filled with the fluid at atmospheric pressure. What intensity of pressure will be developed in it, if 160CC of more fluid is pumped into shell? Also calculate the hoop stress at this pressure and increase in diameter. [10]

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