**Code No: 113AC** **R13**

**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 the temperature stresses are created? | [2] |
| b) | How the factor of safety is taken in different situations? | [3] |
| c) | Describe the concept of binding moment in beams. | [2] |
| d) | What is the contra flexure point? | [3] |
| e) | What is the importance of section modules? | [2] |
| f) | What are the advantages and applications of channel section? | [3] |
| g) | Indicate Normal and Tangential stresses on a plane in the member. | [2] |
| h) | What are principal stresses and strains? | [3] |
| i) | Differentiate between thin and thick cylinders. | [2] |
| j) | What is Neutral axis and polar section modulus? | [3] |

**PART – B**

**(50 Marks)**

2.a) Draw stress-strain curve for Ductile and brittle materials.
b) A straight bar 500 mm long is 25 mm diameter for 300 mm length and 15 mm dia. for the remaining length. If the bar is subjected to an axial pull of 15 KN, find the extension of the bar. Take E = 200 Gpa. [5+5]

**OR**

3.a) How the stresses in composite bars are found?
b) Three vertical rods equal in length and each 15 mm. diameter are equi-spaced in a vertical plane support a load of 10 KN and the rods are adjusted to share the load equally. If an additional load of 10 KN be added. Determine the stress in each rod. The middle one is of copper and the outer ones are if steel. Take $E_{steel}$ = 200 Gpa, $E_{copper}$ = 100 Gpa. [5+5]

4. A simply supported beam of span, 9 m has UDL of 15 KN/m over 4 m from left support and a concentrated load of 20 KN at the centre. Draw SF and BM diagrams. [10]

**OR**

5. A beam of length 12 m. is supported at left end and the other support is at a distance of 8 m from left support leaving a overhanging length of 4 m on right side. It carries a UDL of 10 KN/m over the entire length and a concentrated load of 8 KN at the right extreme end. Draw BM and SF diagram and find the position of contra flexure point. [10]

6.a) What are the applications of bending equation?

b) A cantilever of length 10 m has a cross section of 100 mm × 130 mm has UDL of 10 KN/m over a length of 8 m. from the left support and a concentrated load of 10 KN at the right end. Find bending stress in the beam. [5+5]

**OR**

7. A steel tube of 10 mm. bore with a wall thickness of 1 mm is 1 m. long is full of mercury in the tube. It is placed horizontally and supported at the ends. If the density of steel and mercury is 7.5 and 13.6, find the maximum stress in the tube. [10]

8. Draw "Mohr's stress circle" for principal stresses of 80 $N/mm^2$ tensile and 40 $N/mm^2$ compressive and find the resultant stresses on planes making $25^0$ and $60^0$ with the major principal plane. Find also normal and tangential stresses on these planes? [10]

**OR**

9. A steel specimen is subjected to the following principal stresses 120 $N/mm^2$ (Tensile) 50 $N/mm^2$ (compressive). If the proportionality limit for the steel specimen is 225 $N/mm^2$, find the factory of safety according to:
a) Maximum principal stress theory
b) Maximum principal strain theory.
c) Maximum shear stress theory. [10]

10. A hollow shaft is to transmit 400 KW power at 120 rpm. if the shear stress in not to exceed 60 $N/mm^2$ and internal dia. is 0.65 of the external dia. Find internal and external diameters assuming that the maximum torque is 1.5 times the mean? [10]

**OR**

11. The air vessel of torpedo is 500 mm. external dia. and 10 mm. thick, the length being 2000 mm. Find the change in external dia. and length, when it is charged to 12 $N/mm^2$ internal pressure. Take E = 200 Gpa and poisson's ratio is 0.3. [10]

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