R18/R16/R15/R13

Code No: 153BE/133BE/123AC/113AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2021

MECHANICS OF SOLIDS

(R18 - Common to ME, MCT, MIE; R16 - Common to ME, MCT, AE, MIE, MSNT; R15 - Common to ME, MCT, AE, MSNT; R13 - Common to ME, MCT, AE, MMT)

Time: 3 hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

\- - -

1.a) Explain about different types of stresses and strains.

b) The temperature of a steel ring is raised through 150^0C in order to fit it on a wooden wheel of 1.2 m diameter. Find the original diameter of the steel ring and also the stresses developed in the ring, when it cools back to normal temperature. Assume $E_s = 2 \times 10^5$ N/mm^2 and $\alpha_s = 12 \times 10^{-6}/^0$C. [7+8]

2. A bar of length '*l*' is supported at A and B which are at distances '*a*' from the ends as shown in figure 1. Find the distance 'a' such that maximum moment is least. Using the above results find the most economical length of railway sleeper if the rails are 1.6 m apart. [15]

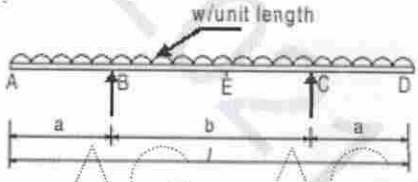

Figure: 1

3.a) Briefly explain Point of contra flexure.

b) Derive relation between S.F., B.M and rate of loading at a section of a beam. [7+8]

4. Derive the expression for finding shear stress in a beam in the form $q = \frac{F}{bI}(a\bar{y})$ with usual notations. [15]

5. State of stress at a point in a material is as shown in the figure 2. Determine a) principal stresses b) maximum shear stress c) plane of maximum shear stress and d) the resultant stress on the plane of maximum shear stress. [15]

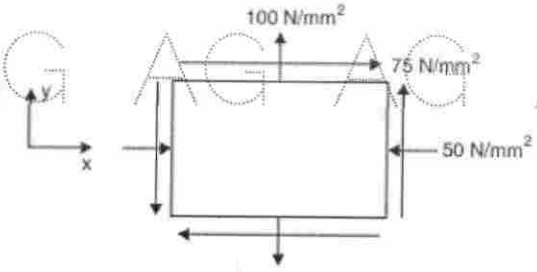

Figure: 2

6. A circular log of timber has diameter D. Find the dimensions of the strongest rectangular section one can cut from this. [15]

7. A hollow shaft, having an internal diameter 40% of its external diameter, transmits a power of 500 KW at 100 R.P.M. Determine the external diameter of the shaft if the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 3 m should not exceed 1.5 degrees. Assume Maximum Torque is equal to 1.25 times the Mean torque and Modulus of Rigidity = 8×10^4 N/mm^2. [15]

8. A thin cylinder 75 mm internal diameter, 250 mm long with walls 2.5 mm thick is subjected to an internal pressure of 7 MN/m^2. Determine the change in internal diameter and the change in length. If, in addition to the internal pressure, the cylinder is subjected to a torque of 200 N m, find the magnitude and nature of the principal stresses set up in the cylinder. E = 200 GN/m^2, v = 0.3. [15]

---ooOoo---