Roll No. Total No. of Pages : 02

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B.Tech. (Automation & Robotics) (2012 & Onward) (Sem.–3)

STRENGTH OF MACHINE ELEMENTS

Subject Code : BTAR-304

M.Code : 63004

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly :

(a) Define ultimate tensile strength.

(b) Distinguish between ductile and brittle materials.

(c) Define coefficient of thermal expansion.

(d) What is the significance of point of contraflexure?

(e) What do you mean by pure bending in beams?

(f) Write the assumptions in derivation of torsion equation.

(g) Discuss the significance of section modulus.

(h) What do you understand by the terms 'column' and 'strut'?

(i) Write the relationship between moment, slope and deflection.

(j) What is factor of safety? Discuss its significance.

SECTION-B

2. Describe ellipse of stress with suitable example.

3. A timber beam 16 cm wide and 20 cm deep is to be reinforced by bolting on two steel flitches each 16 cm × 1 cm in section. Find the moment of resistance when : (a) the flitches are attached symmetrically at the top and bottom and (b) the flitches are attached symmetrically at the sides. Allowable stress in timber is 6 MN/m^2. What is the maximum stress in steel in each case? Take $E_{Steel} = 20\ E_{Wood.}$

4. Explain any two theories of failure.

5. A bar of length 4 m when used as a simply supported beam and subjected to uniformly distributed load of 30 kN/m over the whole span, deflects 15 mm at the centre. Determine the crippling load when it is used as a column with following end conditions :

   (a) both ends pin-jointed, and (b) one end fixed and other end hinged.

6. A beam of length 1 is simply supported and a point load W is acting at its mid span. Use double integration method to find slope and deflection at end points and mid point.

SECTION-C

7. A point is subjected to perpendicular stresses of 50 MN/m^2, both tensile. Using analytical method calculate the normal, tangential and resultant stresses and its obliquity on a plane making an angle of 30 degrees with the axis of second stress. Verify results with Mohr's circle of stress method also.

8. A hollow circular shaft 20 mm thick transmits 294 kW at 200 rpm. Determine the diameters of the shaft if shear strain due to torsion is not to exceed 8.6×10^{-4}. Take modulus of rigidity as 80 GN/m^2.

9. An overhanging beam ABC is simply supported at A and B over a span of 6 m and BC overhangs by 3 m. If the supported span AB carries central concentrated load of 8 kN and overhanging span BC carries uniformly distributed load of 2 kN/m. Drawn shearing force and bending moment diagrams indicating salient points.

NOTE: Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.