Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech. (Mechanical Engg.) (Sem.-4)

STRENGTH OF MATERIALS-II

Subject Code : BTME-401

M.Code : 59129

Date of Examination : 02-07-22

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.**

SECITON-A

1. Write briefly :

(a) Define strain energy.

(b) Define toughness.

(c) What is the importance of theories of failure?

(d) State maximum strain energy theory.

(e) Define stiffness of springs.

(f) Define Circumferential and Hoop stress.

(g) At which point, the maximum hoop stress in a thick pressure vessel under internal pressure occurs and why?

(h) What is the importance of discs of uniform strength?

(i) Why the cross section of a crane hook is generally trapezoidal, explain briefly.

(j) Define shear centre.

SECTION-B

2. State and explain Maxwell's theorem of reciprocal deflection.

3. A shaft is subjected to a maximum torque of 10 kNm and a maximum bending moment of 7.5 kNm, at a particular section. If the allowable equivalent stress in simple tension is 160 MN/m^2, find the diameter of the shaft according to strain energy theory.

4. A cylindrical vessel whose ends are closed by means of rigid flange plates is made of steel plate 3 mm thick. The internal length and diameter of the vessel are 50 cm and 25 cmrespectively. Determine the longitudinal and circumferential stresses in the cylindrical shell due to an internal fluid pressure of 3 MN/m^2. Also, calculate increase in length, diameter and volume of the vessel. Take, E = 200 GN/m^2, and Poisson's ratio = 0.3.

5. A chain link is made of steel rod of 18 mm diameter with straight portion 90 mm in length and ends 90 mm in radius. If the link is subjected to a load of 15 kN, calculate the deflection of the link along the load line. Take, E = 200 GN/m^2.

6. An I-section, with rectangular ends, has the following dimensions: Flanges: 15 cm × 2 cm, Web: 30 cm × 1 cm. Find the maximum shearing stress developed in the beam for a shearing force of 10 kN.

SECTION-C

7. A flat spiral spring is 5 mm wide, 0.25 mm thick and 3 metres long. Assuming maximum stress of 1000 MN/m^2 to occur at the point of greatest bending moment, calculate :

   (a) The torque,

   (b) The work that can be stored in the spring, and

   (c) The number of turns required to wind up the spring. E = 200 GN/m^2.

8. A thick cylinder of 150 mm outside radius and 100 mm inside radius is subjected to an external pressure of 30 MN/m^2 and internal pressure of 60 MN/m^2. Calculate the maximum shear stress in the material of the cylinder at the inner radius.

9. A disc of uniform thickness having inner and outer diameters 100 mm and 400 mmrespectively is rotating at 5000 rpm about its axis. The density of the material of the disc is 7800 kg/m^3 and Poisson's ratio is 0.3. Determine the stress variations along the radius of the disc.

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.