Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (2011 Onwards) (Sem.–4)

STRENGTH OF MATERIALS-II

Subject Code : BTME-401

Paper ID : [A1211]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION 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 strain energy.

b) Distinguish between energy of dilation and distortion.

c) Name various theories of failure.

d) State maximum principal stress theory.

e) Explain the importance of full length leaves in a leaf spring.

f) For what purpose compound cylinders are used?

g) Distinguish between longitudinal and hoop stresses in thick cylinders.

h) What do you mean by discs of uniform strength?

i) What is the importance of trapezoidal cross section of a crane hook, explain briefly?

j) Explain the importance of shear centre.

SECTION-B

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

3. State and explain any two theories of failure with their graphical representations.

4. A thick disc whose outer radius is 300 mm and inner radius is 150 mm rotates at 1430 *rpm*. Compute a) maximum radial stress and b) maximum circumferential stress. Assume Poisson's ratio = 0.3, and density = 7700kg/m^3 of its material.

5. A cylindrical air drum is 2.25 m in diameter with plates 1.2 cm thick. The efficiencies of the longitudinal and circumferential joints are respectively 75% and 40%. If the tensile stress in the plating is to be limited to 120 MN/m^2, find the maximum safe air pressure.

6. Derive mathematically Lame's equation.

SECTION-C

7. A pipe of 200 mm internal diameter and 50 mm thickness carries a fluid at a pressure of 10 MN/m^2. Calculate the maximum and minimum intensities of circumferential stresses across the section. Also sketch the radial stress (pressure) distribution and circumferential stress distribution across the section.

8. A leaf spring of semi-elliptic type has 11 plates each 9 cm wide and 1.5 cm thick. The length of spring is 1.5 m. The plates are made of steel having a proof stress (bending) of 650 MN/m^2. To what radius should the plates be bent initially? From what height can a load of 600 N fall on to centre of the spring, if maximum stress is to be one-half of the proof stress? E = 200 GN/m^2.

9. A solid shaft transmits 1000 kW at 300 *rpm*. Maximum torque is 2 times the mean. The shaft is subjected to a bending moment which is 1.5 times the mean torque. The shaft is made of a ductile material for which the permissible tensile and shear stresses are 120 MPa and 60 MPa respectively. Determine the shaft diameter using a suitable theory of failure. Give justification for the theory used.