Roll No..........

Total No. of Questions : 09

Total No. of Pages : 02

MECHANICS OF MATERIALS
BTEA-301

Time : 03 Hours

B.Tech AE

Maximum Marks : 60

Instruction to Candidates:

1) Section – A is compulsory consisting of Ten questions carrying Two marks each.
2) Section – B containing Five questions carrying Five marks each and students has to attempt any Four questions.
3) Section – C containing Three questions carrying Ten marks each and students has to attempt any Two questions.

Section – A

Q 1) a)   What is maximum shear stress theory?

   b)   What do you mean by longitudinal stress in a thin cylinder?

   c)   What do you mean by 'simple bending' or 'pure bending'?

   d)   Draw stress-strain diagram for ductile materials?

   e)   what is 'equivalent length of a column?

   f)   What do you mean by Lame's equations?

   g)   What do you mean by Section Modulus?

   h)   What are different types of loads?

   i)   Define total strain energy theory?

   j)   What are limitations of Euler's formula for columns and struts.

Section – B

Q2)   Prove that the bending stresses in any fibre is proportional to the distance of that fibre from neutral layer in a beam.

Q3)   A steel rod of 20 mm diameter passes centrally through a copper tube of 50mm external Diameter and 40mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50° C, calculate the stresses

developed in copper and steel. Take E for steel and copper as 200 GN/m^2 and 100 GN/m^2 and α -for steel and copper as 12x10^{-6} per ^{0}C and 18x10^{-6} per ^{0}C.

Q4) Derive an expression for the slope and deflection of a cantilever of length L, carrying a point load W at the free end by double integration method.

Q5) What is equivalent length of a column? What are the important end conditions for a column? Explain them

Q6) Derive the bending equation? Also state assumptions made for derivation of bending equation?

Section – C

Q7) Derive the relation for a circular shaft when subjected to torsion.

Q8) Calculate the safe compressive load on a hollow cast iron column (one end rigidly fixed and other hinged) of 15 cm external diameter, 10 cm internal diameter and 10 cm in length. Use Euler's formula with a factor of safety of 5 and E=95 kN/mm^2.

Q9) A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F, at a section. Find the maximum shear in the cross-section of the beam and draw the shear distributions diagram for the section.