Roll No…….. **Total No. of Printed Pages: [01]**
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B. Tech Civil Engg. (Semester – 3rd)
ENGINEERING & SOLID MECHANICS
Subject Code: BCIES1323
Paper ID: [19110703]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. What is Theory of Unsymmetrical bending?
b. A solid cube is subjected to equal forces on all its faces. What is its volumetric strain?
c. Define the Buckling Load.
d. Establish a relation between Section Modulus, S.F, B.M and Moment ofInertia.
e. Write the simple Bending Equation.
f. Draw the Moment diagram for a cantilever whose free end is subjected To a Bending Moment.
g. What are slender columns?
h. What is the equivalent length of a column fixed at both ends?
i. Define Resilience.
j. What is Hooke,s Law.

Section – B **(5 marks each)**

Q2. Find the deflection and slope at the free end of a cantilever of length l carrying a load p at a distance ‘a’ from the free end. Take flexural Rigidity as EI.

Q3. Derive the Euler’s formula for strut hinged at both ends. State clearly what you regard as the three most important assumptions made in deriving this formula.

Q4. A mild steel bar of 40 mm diameter is subjected to an axial load of 70 kN. Calculate the normal and sheer stresses on a plane making angle of 60o with the direction of the applied load.

Q5. A uniform section steel rope is hanging vertically. Find the elongation of the rope under its own weight. Take density of steel =7800 Kg/m3. E=200 GN/m2. What is the elongation of top 100m of the rope?

Q6. Two shafts A and B of the same material and of the same length are subjected to the same torque. Shaft A is a solid circular section, while shaft B is a hollow circular section whose internal diameter is 0.7 times the outside diameter. If the maximum shear stress in each shaft is to be the same, compare the weights of the two shafts.

Section – C **(10 marks each)**

Q7. Using castigliano’s theorem, obtain the expression for deflection at the centre of a simple supported beam carrying a uniformly distributed load.

Q8. Establish the relationship between different Elastic constants.

Q9. A steel plate of width 60 mm and thickness 10mm is bent into a circular are of radius10m. Determine the maximum stress induced and the bending moment which will produce the max. stress.Take E = 2x 105 N/mm2.