Printed Pages : 1 **EAG-405**

(Following Paper ID and Roll No. to be filled in your Answer Books)

PAPER ID : **Roll No.**

B.TECH.
Theory Examination (Semester-IV) 2015-16
STRENGTH OF MATERIALS

Time : 3 Hours ***Max. Marks : 100***

Note: All symbols have usual meaning.
Assume any relevant data, if missing.

SECTION A

1. Attempt all parts. Write answer of each part in short. (2×10=20)

a) Explain the term volumetric strain.
b) Define Poisson's ratio and volumetric strain.
c) What do you mean by circumferential stress?
d) What is thin cylinder? Give examples.
e) What do you mean by Composite beam?
f) What assumptions are made in simple theory of bending?
g) Explain the term Simple and Compound stress.
h) Differentiate between column and strut.
i) Write down the Rankine formula for columns.
j) What are the assumptions made in Euler's theory of column?

SECTION B

2. Attempt any five questions from this section. (10×5=50)

a) A brass rod 2 m long is fixed at both its ends. If the thermal stress is not to exceed 76.5 N/mm^2, calculate the temperature through which the rod should be heated. Take the values of α and E as 17 x 10^{-6}/K and 90 GPa respectively.

b) Explain circumferential stress and longitudinal stress. A cylindrical shell 800 mm in diameter, 3 m long is having 10 mm metal thickness. If the shell is subjected to an internal pressure of 2.5 N/mm^2, calculate the change in diameter, the change in length and the change in volume. Assume the modulus of elasticity and Poisson's ratio of the material of the shell as 200 kN/mm^2 and 0.25 respectively.

c) Derive the deflection equation for cantilever beam with uniformly distributed load. A cantilever beam of span 3 m is loaded by 500 N at free end. Determine the value of W acting at the centre of beam so that the deflection at the free end is 10 mm. Take E= 15 GN/m^2 I = 10 x 10^6 mm^4

d) Derive an expression for Euler's critical load for a column with one end fixed and one end hinged.

e) Derive an expression for circumferential stress for a thin shell subjected to an internal pressure.

f) A beam 8 m long is simply supported at its ends and carries point loads of 20 KN each at points 2 m from the ends. Calculate, by moment area method, the maximum slope. Also calculate deflection under each load. Take EI = 50000 $KN.m^2$

g) A thick spherical shell of 160 mm internal diameter is subjected to an internal fluid pressure 40 N/mm^2. If the permissible tensile stress is 80 40 N/mm^2, find the thickness of shell.

h) Derive Bending Formula.

SECTION C

Attempt any two questions from this section. (15×2=30)

3. Write a note on Mohr's circle. At a point in a strained material, it is subjected to a simple shear of 75 MPa. Find the principal stresses. Also find normal and tangential stress on a plane inclined at 20^o to the direction of the acting shear stress. Use Mohr's circle method.

4. Attempt the following
   a) Derive an expression for Euler's critical load for a column with one end fixed and the other free.
   b) A column 2.5 m long is pin connected at both ends. It has 50 mm x 100 mm rectangular cross section. Young's modulus of material is 2.0 x 10^5 MPa. Determine the slenderness ratio and the Euler's buckling load.

5. Write short notes on the following.
   a) Stability of a Dam.
   b) Temperature stresses.
   c) Euler's formula