V - 4044

Printed Pages : 3

ME – 405

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

PAPER ID : 4044 Roll No.

B. Tech.

(SEM. IV) EXAMINATION, 2006-07

ADVANCED STRENGTH OF MATERIALS

Time : 2 Hours] *[Total Marks : 50*

Note : *(1) Answer **all** questions.*
(2) Missing data, if any, may be suitably assumed.

1 Answer any **two** of the following : **6×2=12**

a) At a point in a body, the displacement field is linear and is given by the following expressions. Find all the strains.

$U = 0.06x + 0.05y + 0.01z$

$v = 0.01y - 0.03\ x$

$W = 0.02\ x + 0.01\ z$

b) A freely supported beam of span L carries a central load W. The sectional area of the beam is so designed that the moment of inertia of the section increases uniformly from I at ends to 1.5 I at the middle. Calculate the central deflection.

c) Write brief notes on any **two** of the following:-

i) St. Venant's principle

ii) Airy's stress function

iii) CLAPEYRON'S Theorem of three moments.

2 Answer any **two** of the following : **6×2=12**

a) What are assumptions made in deriving the Winkler Bach formula for curved beams? Derive an expression for stress distribution in case of large initial curvature.

b) A curved beam is formed of a tube 80 mm outside diameter and 5 mm thickness. The centre line of this beam is a circular arc of radius 150mm. Determine the greatest tensile and compressive stresses set up by a bending moment of 2 kNM tending to increase its curvature.

c) A ring of mean diameter of 16 cm is made of 2cm diameter bar and carries an axial pull of 4.5 kN. Calculate the values of maximum tensile and compressive stresses.

3 Answer any **two** of the following : $6\frac{1}{2}\times 2 = 13$

a) Prove that the maximum circumferential stress in a rotating disc with a central pine hole is twice the value for a solid disc of the same dimension.

b) A beam of rectangular section, 80 mm wide and 120 mm deep is subjected to bending moment of 12 kN-M. The trace of the plane of loading is inclined at 45° to the Y-Y axis of the section. Locate the neutral axis of the section and calculate the maximum bending stress induced in the section.

c) Write short notes on any **two** of the following :

i) Shear centre

ii) Rotating disks

iii) Unsymmetrical bending.

4 Answer any **two** of the following : $6\frac{1}{2} \times 2 = 13$

a) Find the actual deflection of a closely coiled compression spring having a mean diameter of 10 cm. Wire diameter of 1 cm and 20 turns in total. The total load is 200 N and $G = 80\ GN/M^2$.

b) A laminated steel spring simply supported at ends with a span of 75 cm is centrally loaded with a load of 7500 N. The central deflection under the above load is not to exceed 5 cm and the maximum stress is to be $400\ MN/M^2$. Determine:

i) Width of leaves

ii) Thickness of leaves

iii) Number leaves

iv) Overlap of leaves.

c) Write short notes on any **two** of the following :

i) Torsion of non circular section

ii) Torsion of hollow section

iii) Laminated springs.
