Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 07

M.Sc. Mathematics (2017 Batch) (Sem.–4)

ADVANCED SOLID MECHANICS

Subject Code : MSM-506

M.Code : 75974

Time : 3 Hrs. Max. Marks : 80

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of EIGHT questions carrying TWO marks each.
2. SECTION - B & C. have THREE questions in each section carrying SIXTEEN marks each.
3. Select atleast TWO questions from SECTION - B & C EACH.

SECTION-A

1. **Write short notes on :**

   a) Stress and Strain

   b) Saint-Venant's principle

   c) Torsion of a circular shaft

   d) Flexure of beams by terminal load

   e) Airy's stress function

   f) Effect of internal pressure on spherical shells

   g) Applications of Treffz Method

   h) Thermal stresses in spherical bodies

SECTION-B

2. a) Discuss Hooke's law and its generalisation.

b) Define Isotropic homogeneous elastic medium. Obtain stress strain relations for isotropic homogeneous medium in the form

$$\tau_{ij} = \lambda\delta_{ij}v + 2\mu e_{ij};\ (i,j = 1,2,3)$$

3. a) Explain the strain energy function and its connection with Hooke's law.

b) State and prove Clapeyron's theorem.

4. a) Discuss the bending of beams by a terminal couple.

b) Show that position of origin of coordinates is immaterial in determining the torsion function.

SECTION-C

5. a) A body is in the state of plane stress parallel to the x_1x_2-plane when the stress components τ_{13}, τ_{23}, τ_{33} vanish. Hence illustrate generalised plane stress.

b) What do you understand by plane stress? Discuss the physical circumstances giving rise to the state of plane strain. Illustrate it in case of a cylinder with plane ends and generators parallel to x_3 axis.

6. a) Show that solution of plane stress problem depends upon the solution of bi-harmonic equation.

b) Write short notes on :

i. Plane stress

ii. Plane strain

iii. Generalised plane stress

7. a) Illustrate Ritz method and relation with potential energy V and complimentary energy V* for one dimensional case.

b) Illustrate the Trefftz method by calculating an upper bound for the torsional rigidity of a square beam.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.