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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Aerospace Engg.) (2012 Onwards) (Sem.-4)

AEROSPACE STRUCTURES – I

Subject Code : ASPE-206

M.Code : 71530

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A**1. Write briefly :**

- a) Write equations of equilibrium along x, y, z axes.
- b) Express shear strain γ_{xz} in terms of displacement components u and w .
- c) Define Airy stress function.
- d) Define a statically determinate truss.
- e) Differentiate between a plane truss and 3 D truss.
- f) What is plane frame?
- g) Write equations of equilibrium for plane stress case.
- h) For what type of structure Maxwell reciprocal theorem is valid?
- i) What is the application of Castigliano's 2nd theorem?
- j) Differentiate between an Euler column and a beam column.

SECTION-B

2. For the cantilever of total length L shown below, determine the deflection at end A. Neglect shear energy.

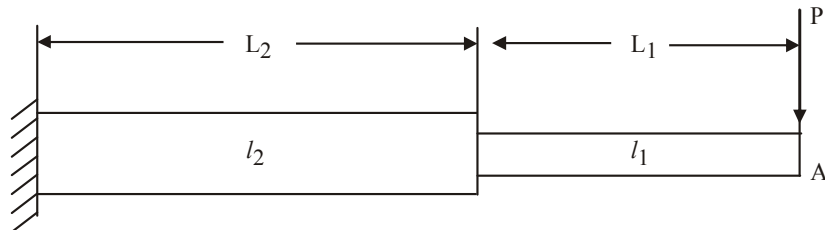


FIG.1

3. A stress function for a rectangular plate is given by $\Phi = Ax^3/6 + Bx^2y/2 + Cxy^2/2 + Dy^3/6$. Obtain the values of direct and shear stresses. Then plot the loading condition for $A=B=C=0$.
4. Find forces in the members AB, AE and EF of the truss as shown below, by method of joints.

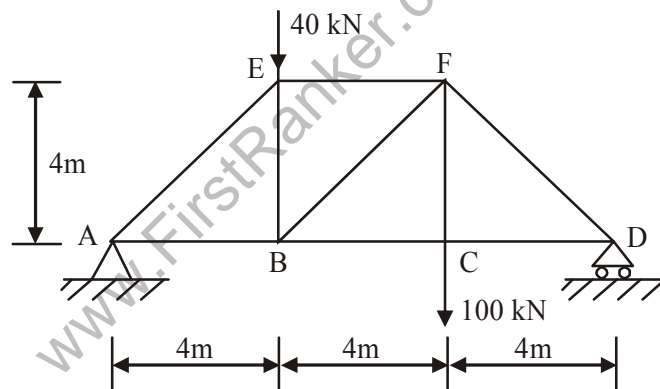


FIG.2

5. A column of length L is pinned at its both the ends. It is subjected to a compressive load P at its ends. Find the expression for its buckling load.
6. Determine the diameter d of a circular shaft subjected to a bending moment M and a torque T , according to maximum strain theory of failure. Use a factor of safety N .

SECTION-C

7. With the help of neat diagrams, explain basic features of structures of a rocket, missile and satellite.
8. A pin-ended beam carries a uniformly distributed load of intensity w per unit length and an axial load P as shown below. Obtain the expression for maximum bending moment at the centre of the beam.

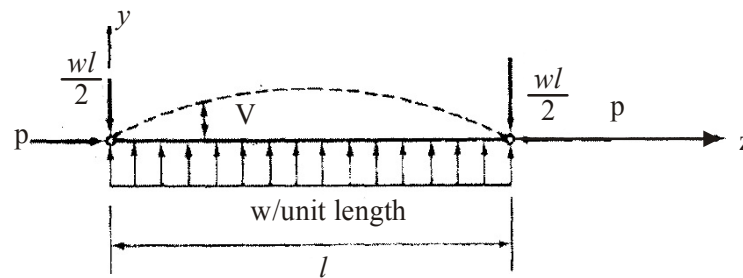


FIG.3

9. Show that the compatibility equation for the case of plane strain, viz.

$$\frac{\partial^2 \gamma_{xy}}{\partial x \partial y} = \frac{\partial^2 \epsilon_y}{\partial x^2} + \frac{\partial^2 \epsilon_x}{\partial y^2}$$

may be expressed in terms of direct stresses σ_x and σ_y in the form

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) (\sigma_x + \sigma_y) = 0$$

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.