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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 2^{nd} 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.

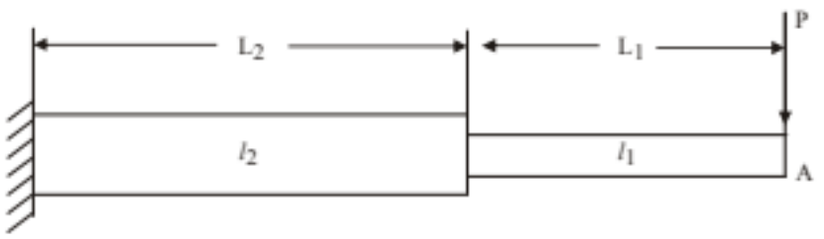

FIG.1

3. A stress function for a rectangular plate is given by $\Phi = Ax^3/6 + B\,x^2\,y/2 + Cxy^2/2 + Dy^3/6$. 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.

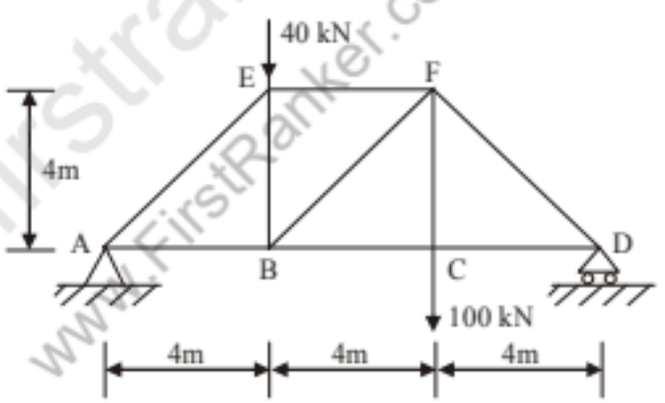

FIG.2

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.

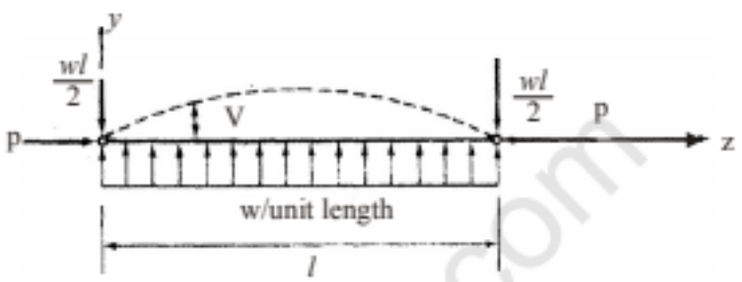

FIG.3

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

$$\frac{\partial^2 \gamma xy}{\partial x \partial y} = \frac{\partial^2 \varepsilon_y}{\partial x^2} + \frac{\partial^2 \varepsilon_x}{\partial y^2}$$

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.