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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(ANE) (Sem.–4)

AIRCRAFT STRUCTURES – I

Subject Code : ANE-206

M.Code : 60514

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) Derive the relations between stress and strain in a plane stress problem.

b) State the principle of superposition.

c) What is Prandtl stress function solution?

d) Derive an expression for the strain energy of a bar subjected to uniaxial tensile force.

e) What is Shear lag?

f) What is meant by a doubly redundant structure?

g) State the different types of loads acting on aircraft structural components.

h) Write down an expression for the shear flow in an open section beam subjected to shear forces S_x and S_y.

i) Explain the term : 'Margin of Safety'

j) What are principal planes and principal stresses?

SECTION–B

2. A point in a strained material is subjected to a tensile stress of 120 N/mm^2 and a compressive stress of 80 N/mm^2 acting at right angles to each other. Find the normal stress, tangential stress and the resultant stress on a plane inclined at an angle of 30° with the compressive stress.

3. A circular section bar of radius R is subjected to equal and opposite torque T at each of its free ends. Determine ; (a) rate of twist and (b) stress distribution.

4. Calculate the rotation of point 1 of the contilever beam in Fig. 1. Using the principle of complementary virtual work. Neglect shear deflection.

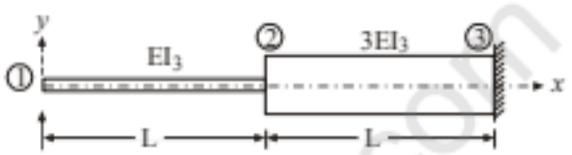

Fig.1

5. Sketch a typical V-H diagram and briefly explain (a) stall regions (b) method of plotting various segments of the diagram (c) Red-line speed of the air plane and (d) Significance of maneuver point and corner velocity.

6. Describe the different types of fitting failures with the help of suitable sketches.

SECTION–C

7. A cantilever of length L and depth $2h$ is in a state of plane stress. The cantilever is of unit thickness, is rigidily supported at the end x = L and is loaded as shown in fig. 2.

   Show that the stress function :

   $$\phi = A\,x^3 + B\,x^2 y + cy^3 = D\,(5x^2 y^3 - y^5)$$

   is valid for the beam and evaluate the constants A, B, C and D in terms of q and h.

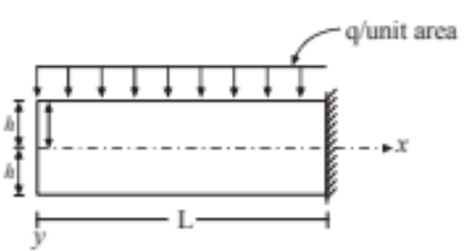

Fig.2

8. A structure is shown in Fig. 3. Assuming the member to be of uniform cross-section throughout find :

   a) Strain energy stored by the structure and hence

   b) Determine the vertical deflection of end A.

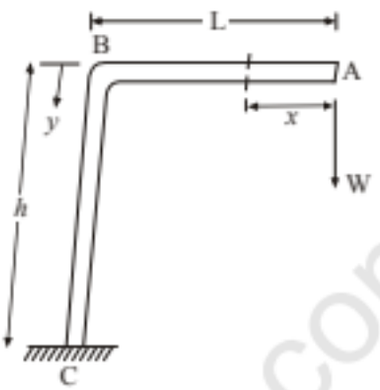

Fig.3

9. Write notes on :

   a) Maneuver Loads

   b) Direct stress distribution due to bending.

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.