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10AE56

Fifth Semester B.E. Degree Examination, June/July 2019

Aircraft Structure – I

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. What are the various types of loads that can act on an aircraft, explain each of them. (12 Marks)
b. With a neat sketch explain V-n diagram. (08 Marks)
- 2 a. What are the desirable properties of aircraft materials? (08 Marks)
b. Write a short note on following:
i) Aluminium alloys
ii) Stainless steel
iii) Titanium alloy (12 Marks)
- 3 a. Draw a neat sketch of stress – strain behavior of low carbon steel. Discuss all salient point (08 Marks)
b. Discuss the following :
i) Creep
ii) Fatigue. (12 Marks)
- 4 a. Derive Clapeyron's three moment equation. (08 Marks)
b. Determine the member forces of the truss shown in Fig Q4(b)

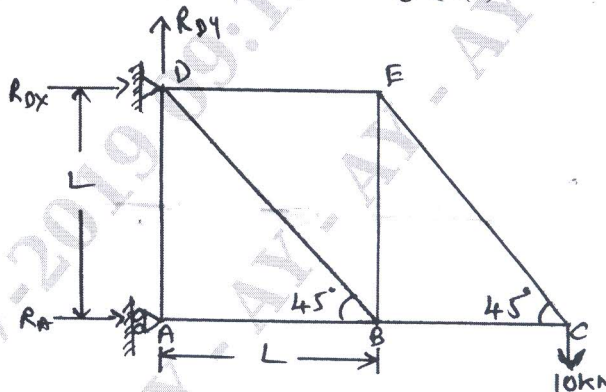


Fig Q4(b)

(12 Marks)

PART – B

- 5 a. State Castigliano's 2nd theorem. Using the same. Find the deflection at the free end of a cantilever subjected to point loaded at its free end. (10 Marks)
b. Explain strain energy and complementary strain energy with neat sketch. (10 Marks)

- 6 a. Derive an expression for Euler's crippling load for a column with both ends fixed. (10 Marks)
b. A 2.5m long hollow circular column with inner diameter to outer diameter ratio of 0.8 is to carry a load of 136kN. One end of the column is fixed and the other end is hinged. Determine the diameters of the column, taking $\sigma_c = 320$ MPa and $a = 1/7500$ for the material of column Take FOS = 2.5. (10 Marks)
- 7 a. Derive equilibrium equation for 3D state of stress in rectangular coordinate system. (12 Marks)
b. Consider the displacement field $u = [y^2i + 3yzj + (4 + 6x^2)k] \times 10^{-2}$. What are the rectangular strain components at the point P(1, 0, 2)? Use only linear terms. (04 Marks)
c. What is plane stress and plane strain conditions? (04 Marks)
- 8 a. Explain the following theories of failure.
i) Maximum principal stress theory
ii) Distortion energy theory. (10 Marks)
b. A shaft is loaded by a torque of 5kN-m. The material has a yield point of 350MPa. Find the required diameter using.
i) Maximum shear stress theory
ii) Maximum distortion energy theory
Take a factor of safety of 2.5. (10 Marks)
