Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 30018

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fourth Semester

Aeronautical Engineering

AE 3403 – AIRCRAFT STRUCTURES – I

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List down the functions of truss.
2. Define Hooke's law.
3. Define the strain energy density.
4. Define indeterminate structures.
5. What is inelastic buckling?
6. State the theory of beam column.
7. What is maximum principal stress theory?
8. List down the importance of distortion energy theory.
9. Draw the fatigue life SN diagram for infinite and finite life design.
10. Define creep.

PART B — (5 × 13 = 65 marks)

11. (a) Members of truss shown in Figure.1 consists of sections of aluminium pipe with cross sectional areas indicated and $E = 73$ GPa. Determine the Vertical deflection of the Point E caused by the load P.

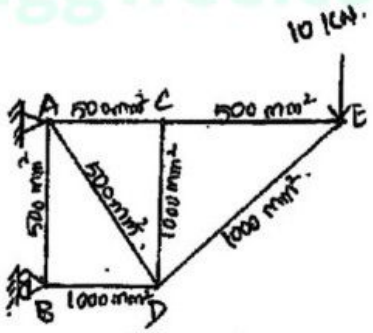

Figure.1

Or

(b) Derive Clapeyron's 3 moment equation for a continuous beam with constant flexural rigidity.

12. (a) Determine the force in the member AB in the truss shown in Fig. 2.

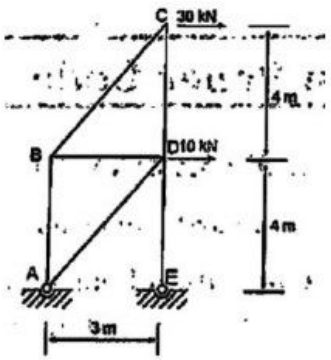

Figure. 2

Or

(b) Discuss about the Castigliano's theory and their applications.

13. (a) Explain the concept of southwell plot in detail with neat sketches.

Or

(b) (i) A column with length of 5 m is fixed in both the ends. The column is made of an aluminium I-beam with moment of inertia of 90 mm^4. Consider the young's modulus to be 70 GPa. Estimate the Euler buckling load. (7)

(ii) Derive the critical load of a simple column subjected to load P. (6)

14. (a) Explain the rankine's failure criteria and von-mises failure criteria.

Or

(b) Discuss about the octahedral shear stress theory and trexa condition.

15. (a) Discuss about the construction and testing procedure for charpy impact testing setup with neat illustration.

Or

(b) Discuss about the construction and testing procedure for fatigue life testing setup with neat illustration.

PART C — (1 × 15 = 15 marks)

16. (a) Draw the shear force and bending moment diagram for the continuous beam ABCD shown in Fig.3 using moment-distribution method.

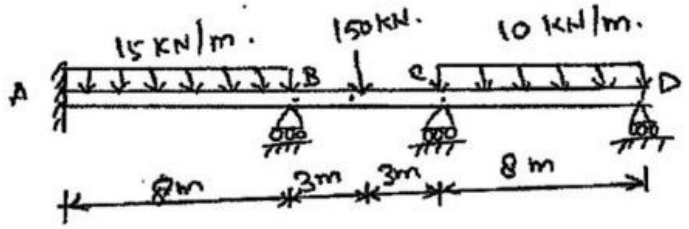

Fig. 3

(b) A machine element is subjected to the following stresses : $\sigma_x = 60$ MPa, $\sigma_y = 40$ MPa and $\tau_{xy} = 50$ MPa. Find the factor of safety if the material is having the yield stress of 300 GPa, using,

(i) Maximum principal stress theory.

(ii) Trexa condition

(iii) von-mises stress criteria.