Reg. No. :

**Question Paper Code : 40521**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Fourth Semester
Aeronautical Engineering
AE 6403 – AIRCRAFT STRUCTURES – I
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. How do you identify whether the given truss is statically determinate or not ?
2. State principle of superposition.
3. Define strain energy and give an expression for strain energy due to bending.
4. Bring out the differences between dummy load method and unit load method.
5. Write the buckling expressions for columns with hinged-hinged, fixed-fixed, fixed-free and fixed-hinged end conditions.
6. What is meant by Southwell plot ?
7. How do you differentiate brittle and ductile materials ?
8. Define factor of safety.
9. How thermal stresses are induced in a structural element ?
10. What is meant by impact load ?

PART – B (5×13=65 Marks)

11. a) Determine the force in each member of the truss shown in figure 11 (a) using method of joints. State if the members are in tension or compression.

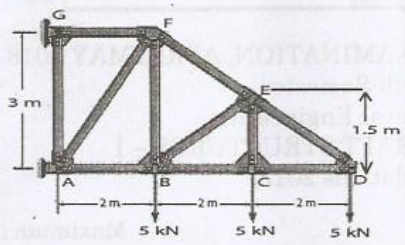


Fig. 11(a)

(OR)

b) i) Write a procedure which provides a general method for determining the end moments on beam spans using moment distribution method. (7)

ii) Explain the procedure to determine the forces in the members of a truss using the method of sections. (6)

12. a) A proped cantilever beam of length L and uniform section is subjected to uniformly distributed load of intensity q over the entire span. Compute the support reactions using energy method.

(OR)

b) Determine mid-span deflection and end slopes of a simply supported beam of span 'L' carrying a UDL 'w' per unit length using unit load method.



13. a) A beam column of length 'L' and flexural rigidity 'EI' is hinged at both the ends subjected to a transverse load at its mid-length in addition to its axial compressive load. Derive the expression for maximum deflection, maximum bending moment and maximum stress.

(OR)

b) i) A pin-ended steel tube 1.5 m long, 25 mm outside diameter, 2 mm wall thickness has an initial curvature $v_o = a \sin(\pi Z/L)$, where a = 5 mm. What is the maximum stress developed due to an axial load of 3.5 kN ? (6)

ii) A column of length L and uniform section is subjected axial compression. Its ends are hinged. Using energy method determine the buckling load. (7)

14. a) i) Indicate all the salient points on stress-strain diagram for ductile materials and explain it in detail. **(7)**

ii) The State of stress shown in Figure 14 (a-ii) takes place at a critical point of a member ($\sigma_{yp}$ = 240 MPa). Calculate the factor of safety n with respect to yielding, employing the following failure criteria :
a) the maximum shear stress b) the maximum energy of distortion. **(6)**

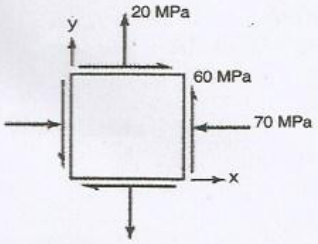


Fig. 14 (a-ii)

(OR)

b) State and explain Von-mises theory and shear stress theory.

15. a) Explain in detail about the various phases of fatigue life.

(OR)

b) Explain in detail about various stages of creep. Also explain the effect of stress and temperature on steady-state creep.



PART – C **(1×15=15 Marks)**

16. a) Derive Clapeyron's three moment equation.

(OR)

b) A bar AB of uniform cross-section is bent into a quadrant of circle of radius R. One end of the bent is fixed at B and other end A is free. At the free end, it carries a vertical load 'W'. Using strain energy method, determine the vertical and horizontal deflection at A.

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