B.E. DEGREE EXAMINATIONS APRIL/MAY 2014

(Regulation 2009)

Fifth Semester

AERONAUTICAL ENGINEERING

AER110: Aircraft Structures- II

Time: Three Hours   **Maximum Marks: 100**

Answer All Questions:-

PART A   (10 x 1= 10 marks)

1. When will the product moment of inertia is not zero
   A) If section is singly symmetrical   B) Doubly symmetrical
   C) At principal axes   D) At Neutral axis

2. Which one of the method is not possible to determine the direct stress of unsymmetrical bending?
   A) K- method   B) Gerard Method
   C) Principal axes method   D) Neutral axis method

3. The gradient of a shear force, through the body is known as
    A) Shear flow   B) Shear centre
    C) Shear modulus   D) Bulk modulus

4. Which one of the following theorem is to relate with polar moment of inertia
    A) Parallel axis theorem   B) Perpendicular axis theorem
    C) Bending moment equation   D) Lami's theorem

5. In idealized beam wing section, booms carry only_____and webs carry only _____
   A) Bending and shear   B) Shear and Bending
   C) Tension and shear   D) compression and tension

6. A thin walled circular tube of cross section A is subjected to a torque T and shear flow q the relation of the T is
   A) 2Aq   B) Aq/2   C) 2A/q   D) 2q/A

7. The ratio of the effective length of a column to the least radius of gyration of its cross section is called
   A) Slenderness Ratio   B) Effective Width
   C) Crippling stress   D) Buckling Stress

8. Wind shear is one of the
   A) Ground Load   B) Air Load
   C) Shear Load   D) Surface Load

9. In Monocoque, the word coque mean_____
   A) Shell   B) Structure   C) Skin   D) Support

10. Which one gives aerodynamically shape to the wing body
    A) Stringers   B) Lips and bulbs
    C) Bulk heads   D) Ribs

PART B   (10 x 2= 20 marks)

11. Difference between Moment of Inertia method and Principal Moment of Inertia method.

12. What do you mean by shear flow?

13. Sketch some open and closed sections.

14. What is elastic axis?

15. Show that for a curved web T = 2Aq.

16. Write down the Gerard equations for crippling stress.

17. Write down the Needham equations for crippling stress.

18. Write a note on composite materials used in aircraft.

19. What is Wagner beam?

20. Distinguish between symmetric and unsymmetric bending.

PART C (5x14=70 Marks)

21. a) A 80 x 80 x 10mm angle section carries a load of 400N and it is a simply supported beam of span of 2.4 m.Using principal moment of inertia method calculate the bending stress at all corners.

(OR)

b) Find the bending stresses at location A and B of an I section shown in fig.1 and calculate the angle between the neutral axis and the centroidal axis.
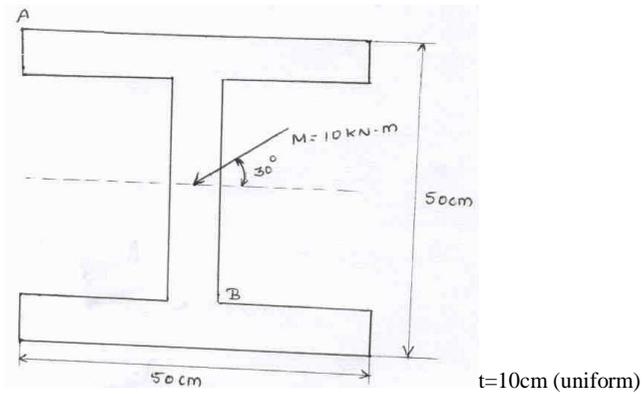
A

$M = 10 \text{ KN-m}$

$30°$

B

50 cm

50 cm

t=10cm (uniform)

Fig.1

22. a) Calculate the shear flow and shear center for the given section shown in fig.2.

D 6m² 10 m C 2m²

30m

4m² 10 m 2m²
A B
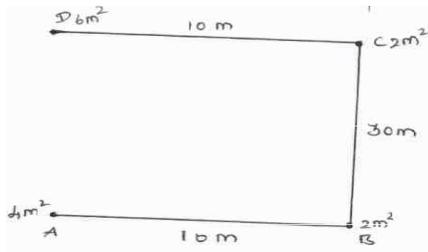
Fig.2

(OR)

b) Calculate the shear flow and shear center for the given section shown in fig.3.
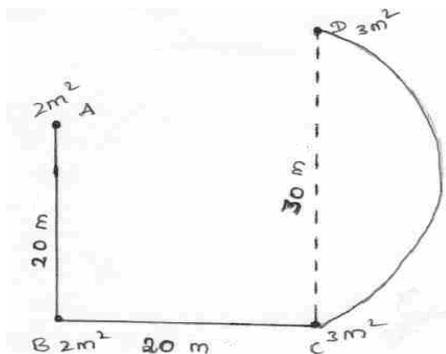

D 3m²

2m² A

30 m

20 m

B 2m² 20 m C 3m²

Fig.3

23. a) Find the shear flow and twist per unit length for the given section shown in fig.4 and given that Torque = 75000 N-cm.The material used is Aluminium with Young's modulus E = 70 GPa and Poisson's ratio = 0.3. Both the cells are Square in cross section
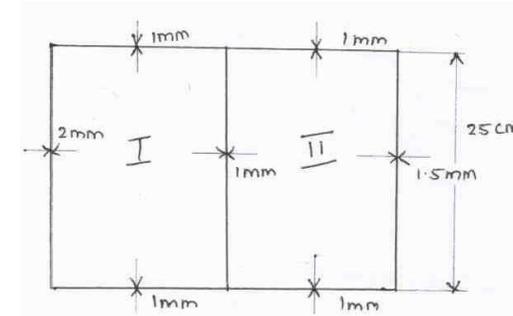

1mm 1mm

2mm I II 25cm

1mm 1.5mm

1mm 1mm

Fig.4

(OR)

b) Derive the expression for twist per unit length of a closed cell and list out the assumptions involved in this.

24. a) Explain the procedure to find the crippling stress using Needham and Gerard's methods.

(OR)

b) (i) Write short notes on effective sheet width. (7)

(ii) Write short notes on local crippling stress. (7)

25. a) (i) What are the factors that produce the higher stresses in aircraft? (6)

(ii) Explain the stress analysis in fuselage. (8)

(OR)

b) (i) Explain the procedure to find the load carrying capacity of a stiffened panel. (8)

(ii) Write short notes on shear resistant web beam. (6)

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