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BAS-014

00105

B.TECH. IN AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2012

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 Hours *Maximum Marks : 70*

Note : *Answer **any seven** questions.*
Use of scientific calculator is permitted.

1. (a) Define the term torsion as it relates to an aircraft structure. **3**

   (b) What are the advantages of a semi - monocoque fuselage ? **4**

   (c) What are the primary flight control surfaces of an aircraft ? **3**

2. (a) A quadrant ring beam of radius 'r' supports a concentrated load 'P' at the free end. Calculate vertical and horizontal deflections at the free end. **6**

   (b) What do you understand by unsymmetrical bending ? Explain the torsion of thin walled closed sections. **4**

3. (a) Find the horizontal deflection at point D for the frame shown in figure 1. 7
Take EI = 20,000 kNm²

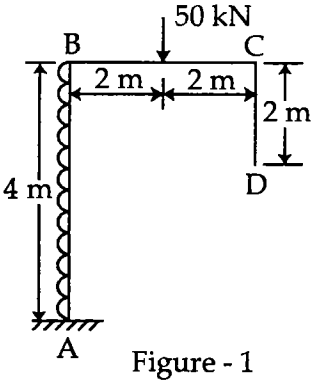

Figure - 1

(b) Write Euler's formula for maximum stress for an initially bent column. 3

4. (a) A simply supported beam is to carry distributed and concentrated loads as shown in figure 2. Draw the shear force diagram (SFD). From the SFD, find the location of the maximum bending moment. 7

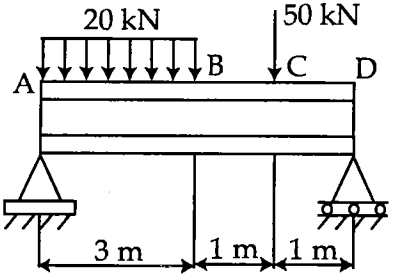

Figure - 2

(b) What are the factors on which the deflection of a spring beam depends ? 3

5. (a) The beam ABC in Figure 3 is simply supported at A and B and has an over hang from B to C. The load consists of a horizontal force P_1 = 4kN acting at the end of a vertical arm and a vertical force P_2 = 8kN acting at the end of the overhang. Determine the shear force and the bending moment at a cross section located 3 m from the left hand support. 7

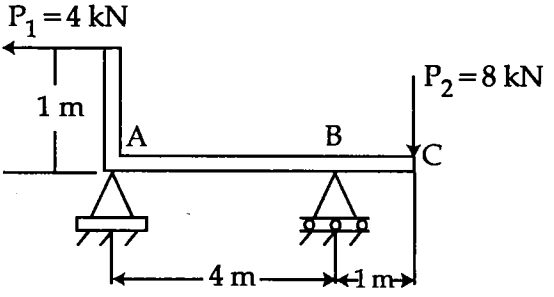

Figure - 3

(b) What are the various types of stresses developed in thin cylinders ? 3

6. (a) Explain thin walled open sections and closed sections. 4

(b) Derive an equation to determine the stresses on a thin walled spherical shell. 6

7. (a) What are the types of mechanical stresses that can occur in aircraft components ? 4

(b) Explain the steps in measuring load stress using strain gauge. 6

8. (a) Explain the functioning of a beam type torque wrench. 3

(b) The vertical shear force on a channel section is 3kN. Find the shear flow and shear centre of the section (figure 4). Assume constant thickness of 10 mm throughout the section. $I = 1.21 \times 10^8$ mm^4 7

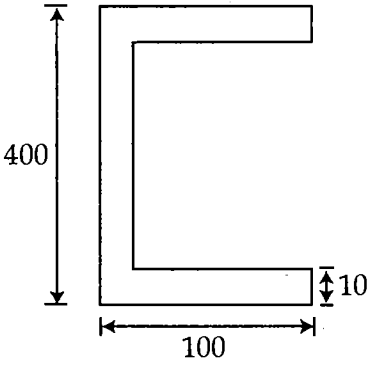

Figure - 4

9. (a) Explain how a load cell works ? 4

(b) A hollow cylindrical steel shaft is 1.5 m long and has inner and outer diameters of 40 mm and 60 mm respectively. What is the largest torque which may be applied to the shaft if the shearing stress is not to exceed 120 MPa ? What is the corresponding minimum value of the shearing stress in the shaft ? 6