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BAS-014

B. Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00156

June, 2015

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours *Maximum Marks : 70*

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

1. (a) Define the term 'Torsion'. *3*

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

(c) What are the primary flight control surfaces of an aircraft ? Explain their functions. *7*

2. (a) A quadrant ring beam of radius 'r' supports a concentrated load 'P' at the free end. Calculate vertical and horizontal deflection at the free end. *8*

(b) What do you understand by unsymmetrical bending ? Explain the torsion of thin walled closed sections. *6*

3. (a) Find the horizontal deflection at point D for the frame shown in Figure 1.

Take EI = 20,000 kNm^2. *8*

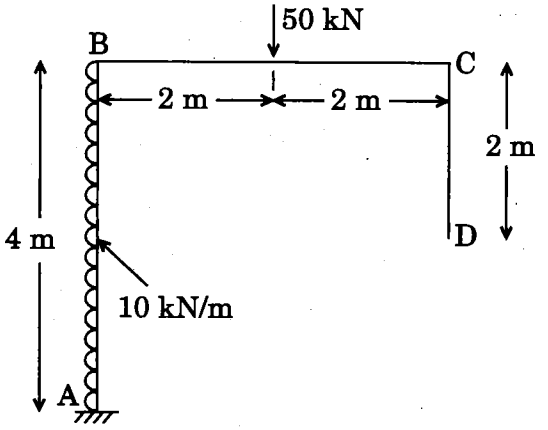

Figure 1

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

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

4. (a) The beam ABC in Figure 2 is simply supported at A and B and has an overhang from B to C. The load consists of a horizontal force P_1 = 4 kN acting at the end of a vertical arm and a vertical force P_2 = 8 kN 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. *10*

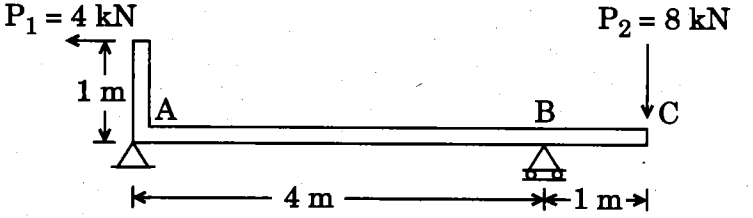

Figure 2

(b) What are the various types of stresses developed in thin cylinders ? *4*

5. (a) Give a detailed description of thin walled open sections and closed sections. *6*

(b) Derive an equation to determine the stresses on a thin walled spherical shell. *8*

6. (a) Explain the different types of aircraft components with neat sketches. *7*

(b) What are the types of mechanical stresses that can occur in aircraft components ? What are their effects ? *7*

7. (a) Explain the functioning of a beam type torque wrench. *4*

(b) The vertical shear action on a channel section is 3 kN. Find the shear flow and shear centre of the section shown in Figure 3. Assume constant thickness of 10 mm throughout the section. $I = 1{\cdot}21 \times 10^8\ mm^4$. *10*

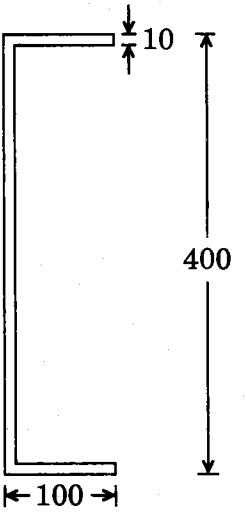

Figure 3

8. (a) Explain the working of a load cell. *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 shearing stress in the shaft ? *10*