Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER 2013

Subject Code: 150103 **Date: 21-05-2013**

Subject Name: Aircraft structure - II

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** State and prove with usual notations Castiglianoõs first theorem. **(07)**

(b) Explain Flight envelop diagram. **(07)**

Q 2 **(a)** A beam of size 500 x 230 mm is subjected to a bending moment of 20 kN m at an angle 60ę wrt *x* axis. (i) Locate the Neutral axis and (ii) find stresses at all corners. **(07)**

(b) An ISMB 300 x 140 beam as shown in figure 1 carries at a certain section, a bending moment ñMò, the trace of the plane of loading being inclined at 25ę to the y axis. If, I_{xx} =8606 cm^4 and I_{yy} = 453.9 cm^4, Find ñMò if permitted bending stress is 140 MPa. **(07)**

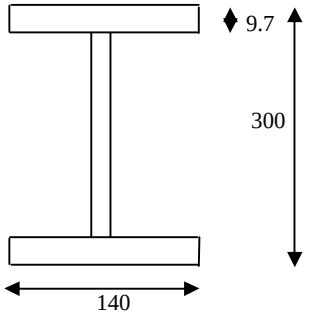

Figure 1

OR

Q 2 **(a)** Locate shear center of a semicircle section having thickness ñtò and radius ñRò. **(07)**

(b) A quadrant ring beam of radius óróô supports a concentrated load óPô at the free end, calculate vertical & horizontal deflection at free end. **(07)**

Q.3 **(a)** The vertical shear action on an ISMB 300 x 140 beam as shown in figure 1 is 175 KN. Find the shear flow and shear center of the section. Assume thickness in flange as 9.7 mm and thickness of web 6.7 mm. I_{xx} =8606 cm^4 and I_{yy} = 453.9 cm^4. **(07)**

(b) What do you understand by unsymmetrical bending? Explain the torsion of thin walled closed sections. **(07)**

OR

Q.3 (a) Find out shear centre of thin walled section as shown in Fig. 2. Assume constant thickness throughout the section. (07)

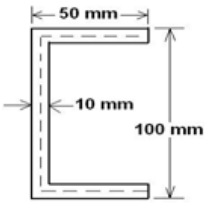

Figure 2

(b) Explain torsion of multi cell closed box beam. (07)

Q.4 (a) Explain thin walled open sections & closed sections and define shear center with its practical significance. (07)

(b) A cantilever beam ABCD is fixed at end A. AB= 4 m BC = 5 m and CD =3 m. Span BC carries udl of 4 kN/m. Find slope and deflection at point B 1using unit load method. Take EI=20000 kNm^2. (07)

OR

Q.4 (a) A cantilever beam ABCD is fixed at end A. AB= 4m BC =5 m and CD =2 m. Span BC carries udl of 5 kN/m. Find slope and deflection at point B using Castiglianoôs first theorem. Take EI=20000 kNm^2. (07)

(b) Differentiate between Flexibility matrix method and Stiffness matrix method. (07)

Q.5 (a) A beam ABC has spans AB= 3m BC = 5 m. End ñAò is fixed and end ñCò is hinged. Span AB carries udl of 2 kN/m. Analyze the beam using flexibility system approach. (07)

(b) Find horizontal deflection at point D for the frame shown in figure. 3 using any method. Take EI=20000 $kN.m^2$. (07)

OR

Q.5 (a) A fixed beam ABC of length 5 m is fixed at ñAò and ñCò. Spans AB= 4m BC = 3 m. It carries a point load of 250 KN at ñBò. Analyze the beam using stiffness system approach. (07)

(b) Find horizontal deflection at point C for the frame shown in figure 3 using any method. Take EI=20000 $kN.m^2$. (07)

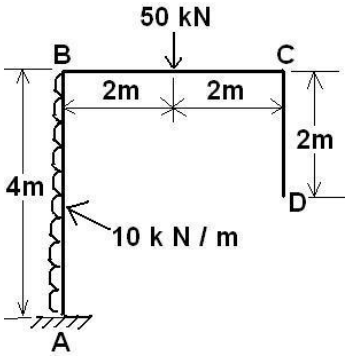

Fig. 3

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