Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E SEM-V Examination-Nov/Dec.-2011

Subject code: 150103 **Date: 26/11/2011**
Subject Name: Aircraft structure-II
Time: 02.30 pm-05.00 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 Castigliano's first theorem. (07)

(b) Explain Flight envelop diagram. (07)

Q 2 (a) Locate shear center of a semicircle section having thickness "t" and radius "R". (07)

(b) An ISMB 300 x 140 beam as shown in figure 1 carries at a certain section, a bending moment "M", the trace of the plane of loading being inclined at 15˚ to the y axis. If, I_{xx} =8606 cm^4 and I_{yy} = 453.9 cm^4, Find "M" if permitted bending stress is 120 MPa. (07)

OR

(b) A beam of size 600 x 400 mm is subjected to a bending moment of 10 kN m at an angle 60˚ wrt axis. (i) Locate the Neutral axis and (ii) find stresses at all corners. (07)

Q.3 (a) The vertical shear action on an ISMB 300 x 140 beam as shown in figure 1 is 75 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) A box beam as shown below is subjected to a vertical shear force of 125 kN. The bending Analysis, neglecting bending stress gives axial stiffener between cross section 1 cm apart as Shown in figure 3. Determine the shear flow in the box beam. (07)

OR

Q.3 (a) The vertical shear action on a channel section is 25 kN. Find the shear flow and shear center of the section as shown in figure 2. Assume constant thickness of 10 mm throughout the section. I = 1.21 x 10^8 mm^4 (07)

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

Q.4 (a) A quadrant ring beam of radius 'r', supports a concentrated load 'P' at the free end, calculate vertical & horizontal deflection at free end (07)

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

OR

Q.4 (a) A cantilever beam ABCD is fixed at end A. AB= 3m BC = 4 m and CD =2 m. Span BC carries udl of 3 kN/m. Find slope and deflection at point B using Castigliano's 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= 2m BC = 3 m. End "A" is fixed and end "C" is hinged. (07)
Span AB carries udl of 3 kN/m. Analyze the beam using flexibility system approach.

(b) Find horizontal deflection at point D for the frame shown in figure. 4 using any (07)
method. Take EI=20000 kN.m^2.

OR

Q.5 (a) A fixed beam ABC of length 5 m is fixed at "A" and "C". Spans AB= 2m BC = 3 m. (07)
It carries a point load of 150 KN at "B". Analyze the beam using stiffness system approach.

(b) Find horizontal deflection at point C for the frame shown in figure. 4 using any (07)
method. Take EI=20000 kN.m^2.

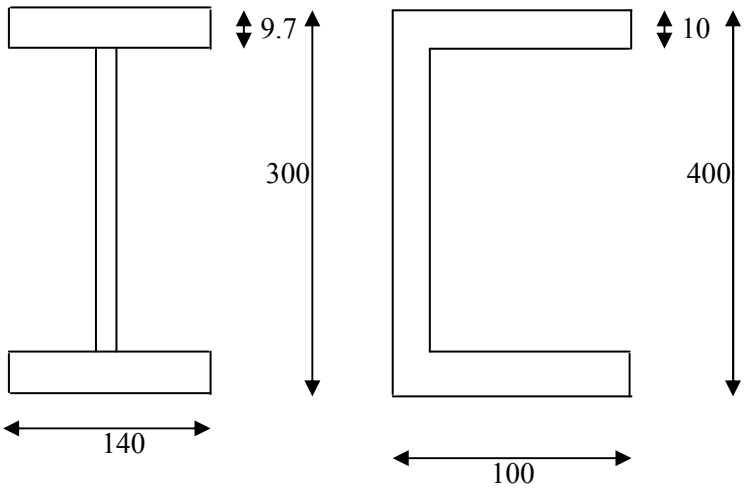

Figure 1

Figure 2

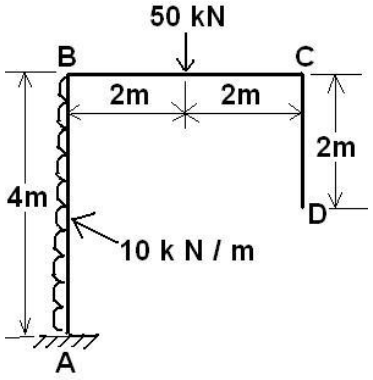

Fig. 4

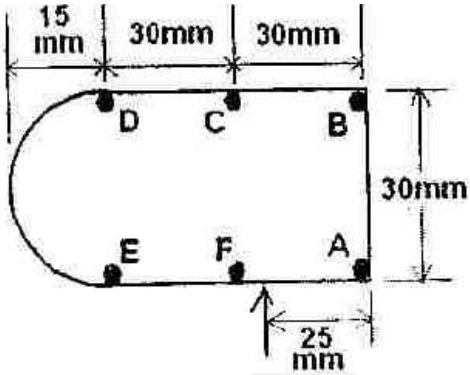

Fig. 3

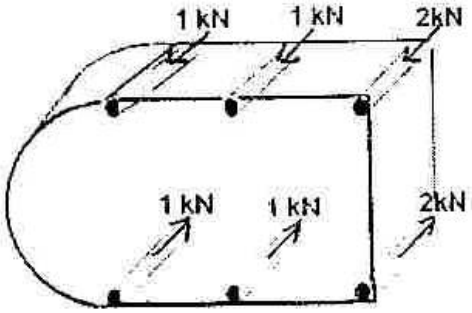

Fig. 3