GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– V • EXAMINATION – SUMMER 2015

Subject Code: 150103   **Date:11/05/2015**
Subject Name: Aircraft Structure - II
Time: 02.30pm-05.00pm   **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 Castigliano's Displacement theorem.	**07**
	(b)	Explain Flight Envelope (V-n diagram) with the help of sketch.	**07**
Q.2	**(a)**	Discuss in detail stress analysis of Aircraft components.	**07**
	(b)	State and prove Castigliano's Force theorem.	**07**
		OR	
	(b)	Find the deflection at free end of cantilever beam having 6m long loaded with uniformly distributed load of 20 kN/m. Take $E = 2 \times 10^5$ kN/mm^2 and $I = 2 \times 10^5$ mm^4 using unit load method.	**07**
Q.3	**(a)**	Find the support reaction for a beam as shown in figure- 1, using Catigliano's second theorem. Take $E = 2 \times 10^5$ kN/mm^2 and $I = 3 \times 10^5$ mm^4	**07**
	(b)	Find support reactions for a frame as shown in figure-2 using theorem of Least work. Take EI constant.	**07**
		OR	
Q.3	**(a)**	Determine the principal moment of inertia of the unequal angle section 90 x 60 x 10 mm as shown in figure- 3. Take Ixx = 1125952 mm^4 & Iyy = 400952 mm^4	**07**
	(b)	Determine the stresses induced at points P1 and P2 for the above unequal angle section and it is subjected to a sagging bending moment of 700 N.m.	**07**
Q.4	**(a)**	Discuss difference between Force method and Displacement method.	**07**
	(b)	For the beam as shown in figure-4, find the rotation at point B and c using stiffness method. Take $E = 200 \times 10^6$ N/mm^2 and $I = 100 \times 10^3$ mm^4	**07**
		OR	
Q.4	**(a)**	Write steps to analyze the structure by the Flexibility method.	**07**
	(b)	For the beam as shown in figure-4, find the support reaction and plot shear force and bending moment diagram using stiffness method. Take $E = 200 \times 10^6$ N/mm^2 and $I = 100 \times 10^3$ mm^4	**07**
Q.5	**(a)**	Explain in detail Shear flow and shear center with appropriate figure.	**07**
	(b)	ISMB 300 x 140 mm beam as shown in figure- 5 carries at a certain section, a bending moment, the trace of the plan of loading being inclined at 30º to the y-axis, if Ixx = 7719 cm^4 & Iyy = 456 cm^4. Find M if maximum bending stress induced is 120 N/mm².	**07**
		OR	
Q.5	**(a)**	Define shear flow in thin-walled open sections. Draw Shear flow and stress distribution diagram in channel section and I – section.	**07**
	(b)	Locate the shear center of a section as shown in figure- 6. Draw shear flow and shear distribution diagram.	**07**

20 kN

A |——— 2m ———|——— 2m ———| B

Figure 1

Figure 4

40 kN   50 kN   30 kN/m

A |—1m—|—1m—|—1m—| B ~~~~~~~~ C
                        |—— 4m ——|

Figure 4

Figure 2

10 kN/m

B ~~~~~ C
1 m   3 m

50 kN →

3 m   4 m

Figure 2

A   D

Figure 3

P1

90mm

u

θ=23.389

X

P2

|—— 60 mm ——|

Figure 3

Figure 5

Y

P

30

300 mm
x

|—— 140 mm ——|

Figure 5

Figure 6

|—— 200 mm ——|

10 mm

300 mm

20 mm

10 mm

Figure 6

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