Roll No: --------------------------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

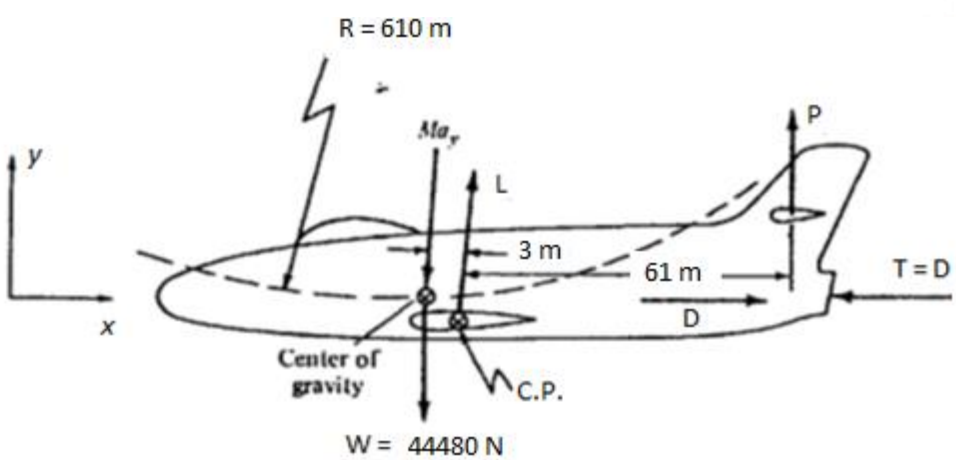
Program: B.Tech. ASE, ASEA	**Semester : V**
Subject (Course): Aircraft Structures	**Max. Marks : 100**
Course Code : ASEG 335	**Duration : 3 Hrs**
No. of page/s: 03	

Instructions- Read all the below mentioned instructions carefully and follow them strictly

1) Mention Roll No. at the top of the question paper.
2) Do not write anything else on the question paper except your roll number.
3) ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.
4) Internal choice is given for question number 10.

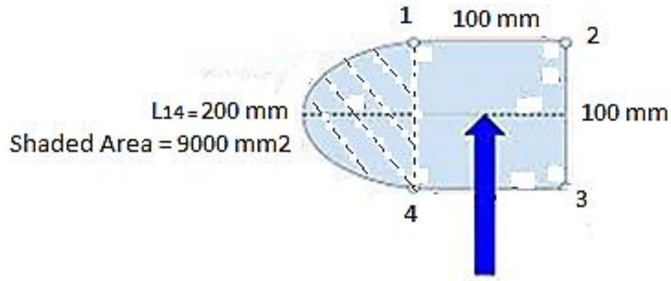
SECTION – A (5 X 4 = 20 MARKS)

1. Explain the importance of empty weight in Aircraft.
2. Define shear center? Explain the importance of shear center in aircraft wing structure.
3. Explain the concept of complementary shear stress with suitable mathematical expressions.
4. An airplane is flying at 890 km/hr in level flight when it is suddenly pulled upward into a curved path of 610 m radius as shown in Figure below. Find the load factor of the airplane.

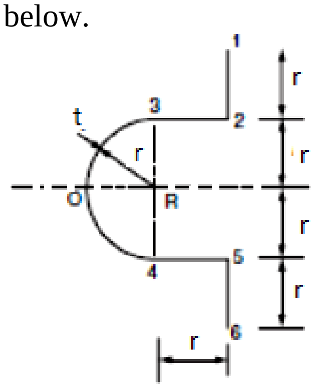


SECTION – B (10 X 4 = 40 MARKS)

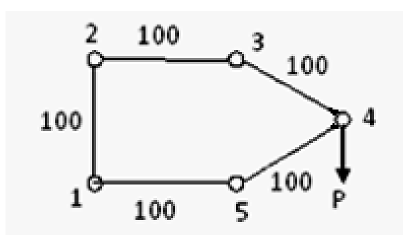
5. An idealized section as shown in figure below is subjected to shear force of 10 KN in vertical direction, passing through the shear center and a torque of 15 KN-m (clockwise). Determine the shear flow distribution in each member of the idealized section. Assume that the Area of each boom is 200 mm^2 and thickness of all the walls is 2mm.



6. Calculate the Moment of inertia about the horizontal centroidal axis of the thin walled section as shown in figure below.

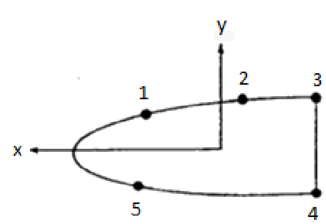


7. With reference to the idealized section as shown in Figure below. Find the ratio of the shear flow $q_{23}:q_{34}$. Area of each booms are 150 mm^2.



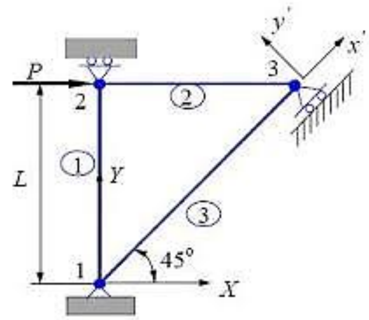
8. The box beam as shown in figure below resists bending moments of M_x = 10 kN-m and M_y = 12kN-m. Find the bending stress in each stringer member. Assume that the webs are ineffective in bending and the areas and coordinates of the stringers from centridal axis are as follows.

No.	Area, mm2	x, mm	y, mm
1	2025	66.5	210.8
2	100	274.3	231.6
3	400	-627.4	247.6
4	3364	-627.7	-33
5	625	66.5	-30.5

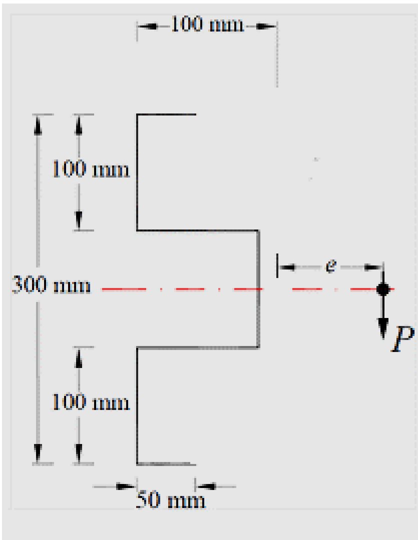


SECTION – C (20 X 2 = 40 MARKS)

9. Determine the displacement of Joint 3 using Matrix Method/Energy method of the pin-jointed framework as shown in figure below. Assume P = 5 kN, L = 2 m and A= 250mm^2, E=2x10^{5}N/mm^2 is same for all the members.



10. Determine the location of shear center for the section as shown in Figure below, when a force 'P' is applied through the shear center in downward direction. Assume the thickness 't' is same for all the members.



Or

For the thin walled beam cross-section as shown in figure below, is subjected to a vertical shear force through the shear center 'O'. Calculate the distance 'e'. Assume that the thickness t = 2mm is constant for all the walls.