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10AE72

Seventh Semester B.E. Degree Examination, Aug./Sept.2020

Aircraft Structure – II

Time: 3 hrs. Max. Marks:100

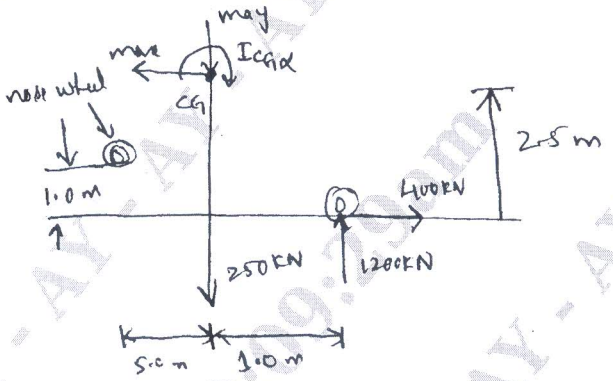
Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Explain the different types of loads acting on an aircraft. **(10 Marks)**

b. An aircraft having weight of 250kN and a tricycle undercarriage lands at a vertical velocity of 3.7m/s. such that the vertical and horizontal reaction on the wheels are 1200kN and 400kN respectively at this instant the noise wheel is 0.1m from the ground shown in Fig.Q1(b). If a moment of inertia of aircraft about its <g is 5.65×10^8 Ns^2 mm. Determine the inertia force on the a/c the time taken for its vertical velocity to become zero and its angular velocity at this instant. **(10 Marks)**



Geometry of the aircraft, Fig.Q1(b)

2 a. What are the assumptions of symmetric bending? Explain the asymmetric bending? Explain the asymmetric bending with associated equation? **(10 Marks)**

b. If the B.M. is applied in in horizontal plane and is a clockwise sense about 'cy' when viewed in the direction 'yc'. Find the direct stress distribution of the beam? [Refer Fig.Q2(b)]

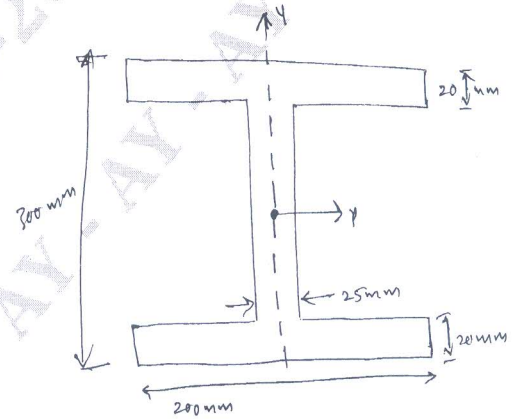


Fig.Q2(b) **(10 Marks)**

3 a. What is shear flow? List he assumption of shear flow analysis. **(08 Marks)**

b. Find the position of shear centre and shear flow between the stringers under the given load. [Refer Fig.Q3(b)]

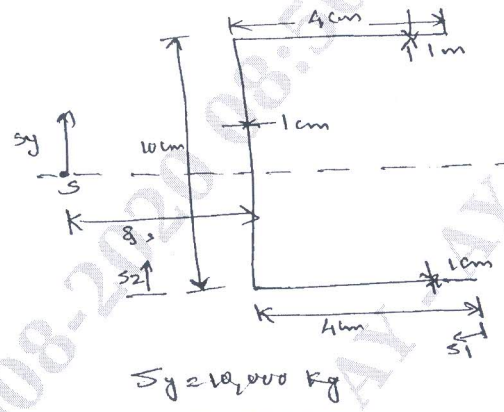


Fig.Q3(b) **(12 Marks)**

4 a. Derive the displacement associated with Bredt – Batho shear flow. **(10 Marks)**

b. A thin walled circular section beam of diameter 200 mm and length 2 meter is firmly restrained against rotation at each end. A concentrated torque of 30 kNm is applied at its mid-span point. If the maximum shear stress in the beam is limited to 200 N/mm^2 and maximum angle of twist to 2°. Calculate the minimum thickness of the beam wall. Take G = 25,000 N/mm^2. **(10 Marks)**

PART – B

5 a. Derive an expression for the non–trivial solution for buckling load of a thin flat plate of length "b" and width "a". **(10 Marks)**

b. Discuss the many ways of buckling of a stiffened thin panel. Write suitable assumptions where ever required. **(10 Marks)**

6 a. What are Complete Tension field beams? Explain and derive an expression for tension stress and normal stress in web. **(14 Marks)**

b. If J of the open circular section is bt^3/3, compare it with J of a closed section of the same dimension. [Refer Fig.Q6(b)]

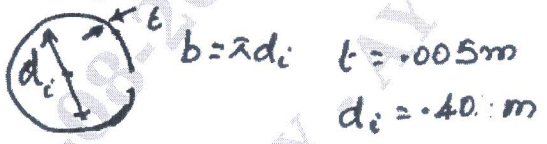


Fig.Q6(b) **(06 Marks)**

7 a. Explain design criteria in relation to aircraft design. **(10 Marks)**

b. For the wing shown in Fig.Q7(b), calculate shear force, B.M and torque distribution. Assume lift distribution along 0.25C and elastic axis at 0.45 C. **(10 Marks)**

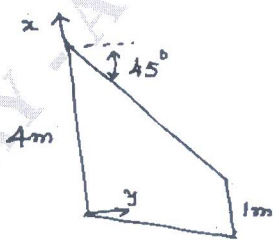
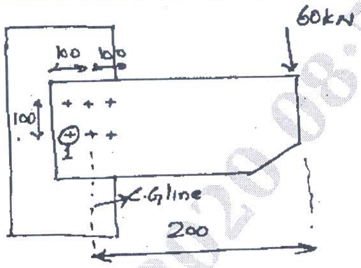


Fig.Q7(b)

y(m)	Lift
0.6	1000 N
1.2	800 N
1.8	600 N
2.4	400 N
3.0	200 N

8 a. A Bracket is attached to the wall with the help of 6 rivets. The different arrangement of rivets are shown in Fig.Q8(a). The maximum allowable stress in shear is given 80 N/mm^2 and the bracket carries a load of 60 kN. Find the required rivet diameter.



Assume origin at rivet 1.
All units in mm (length)

Fig.Q8(a) **(12 Marks)**

b. Given in Fig.Q8(b) is an axially loaded unsymmetrical welded section. Derive expression for ℓ_1 and ℓ_2 so that resisting moment of the welds about C.G axis is zero.

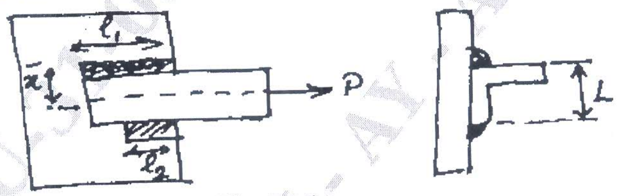


Fig.Q8(b) **(08 Marks)**

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