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10AE72

Seventh Semester B.E. Degree Examination, June/July 2016
Aircraft Structures – II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Draw a V-n diagram of a typical aircraft and explain. **(08 Marks)**

b. What are the loads acting on various components of the aircraft? **(06 Marks)**

c. What is the concept of allowable stress? **(06 Marks)**

2 a. Derive the stress induced by a moment 'M' acting on the beam given in Fig. Q2(a). **(10 Marks)**

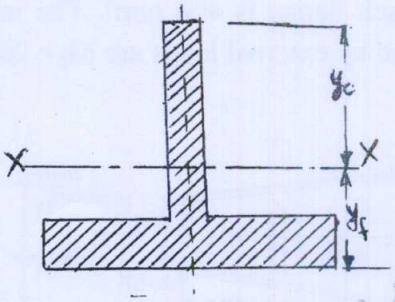

Fig. Q2(a)

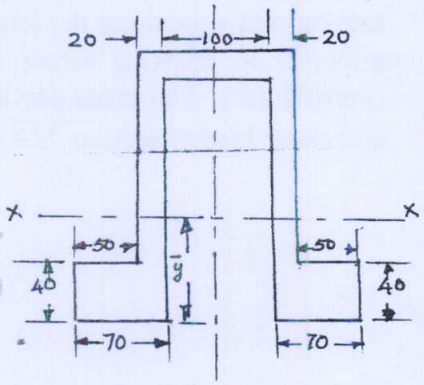

Fig. Q2(b)

b. A cast iron beam section as shown on Fig. Q2(b) subjected to a bending moment. The tensile stress at the bottom edge is 20 N/mm^2. Determine: i) the value of the bending moment ii) the value of stress at the top edge. **(10 Marks)**

3 a. Derive an expression for the shear stress of an open section which supports shear forces S_x and S_y in the XY axis as shown in Fig. Q3(a). There is no twist on the beam cross section. **(10 Marks)**

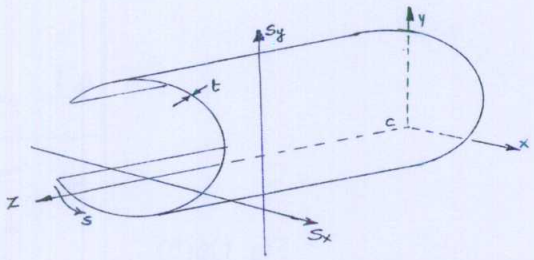

Fig. Q3(a)

b. Calculate the position of the shear center of a thin walled section shown, the thickness of the section is 2 mm and is constant throughout. **(10 Marks)**

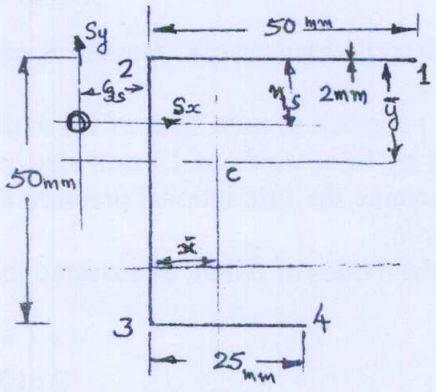

Fig. Q3(b)

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.

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. Determine the shear flow distribution in the web of a tapered beam given in Fig. Q6(a) at a section mid way along the length. The web of the beam has a thickness of 2 mm and is fully effective in resisting direct stress. The beam tapers symmetrically about the horizontal centroid axis. The cross section of each flange is 400 mm^2. The internal bending moment and shear load at section A/A produced by external loads are M_x= 20 kN m and S_y=–20 kN. **(10 Marks)**

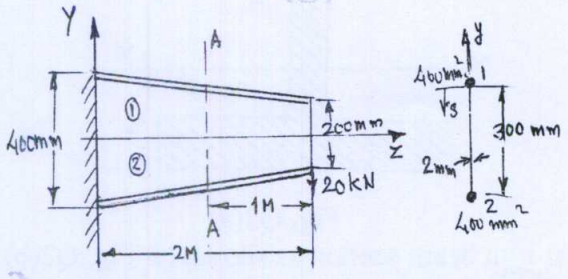

Fig. Q6(a)

b. A wing spar is positioned in yz plane and comprises of two flanges and a web. The elemental length is shown in Fig. Q6(b). At the section z, the beam is subjected to a positive bending moment M_x and a positive shear force S_y. Derive an expression for the shear flow distribution in the web. **(10 Marks)**

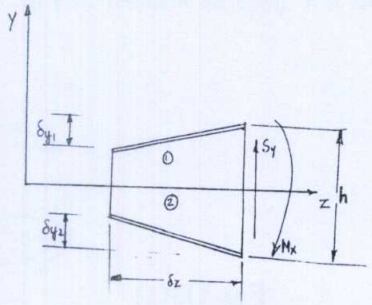

Fig. Q6(b)

7 a. What are the structure design criteria to be considered when designing the aircraft? **(10 Marks)**

b. Explain Aircraft structure life assessment procedure. **(10 Marks)**

8 a. A circular penstock of mild steel of 1.6 m dia, is fabricated from 16mm plate, lapping it and securing it by fillet welds of 12 mm size, provided on the inside and outside of the lapped ends. Determine the safe internal pressure that can be allowed. Safe stress in weld be taken as 100 N/mm^2. **(08 Marks)**

b. What are the modes of failure of a riveted joint? **(12 Marks)**

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