USN | | | | | | | | | |

10AE72

Seventh Semester B.E. Degree Examination, Feb./Mar.2022
Aircraft Structures - II

Time: 3 hrs.   Max. Marks:100

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

PART – A

1.   a. With neat sketch, explain the construction of different types of fuselage used in aircrafts.
               (10 Marks)

     b. Draw the flight envelope and explain the salient features.   **(10 Marks)**

2.   a. The cross section of a beam has the dimensions shown in Fig. Q2 (a). If the beam is subjected to a negative bending moment of 100 KNm applied in a vertical plane, determine the distribution of direct stress through the depth of the section.   **(10 Marks)**
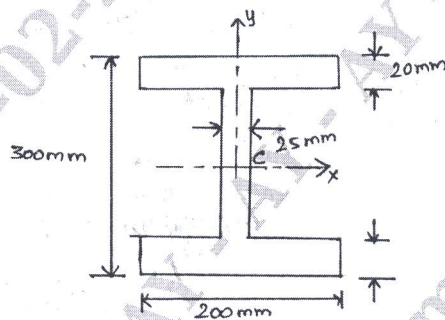

Fig. Q2 (a)

     b. Derive the equations to determine the direct stress distribution due to unsymmetrical bending and write the equation to find neutral axis.   **(10 Marks)**

3.   a. Derive the equation for shear flow distribution is open section beams. Define shear center.   **(10 Marks)**

     b. Calculate the shear flow distribution in the thin-walled open section shown in Fig. Q3 (b), produced by a vertical shear load S_y acting through its shear centre.   **(10 Marks)**
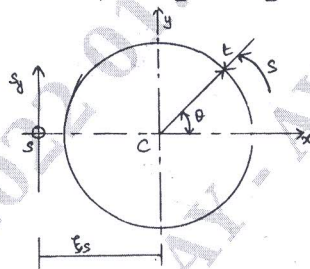

Fig. Q3 (b)

4.   a. Derive the equation to determine the shear flow distribution in closed section beams.
               (10 Marks)

     b. Determine the shear flow distribution in the walls of the thin-walled closed section beam shown in Fig. Q4 (b). The wall thickness t is constant throughout.   **(10 Marks)**
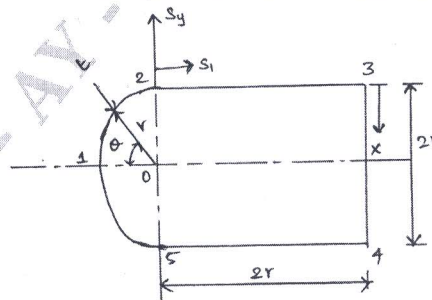

Fig. Q4 (b)

PART – B

5 a. Explain the buckling of isotropic flat plates in compression. **(10 Marks)**

   b. Explain the Needham and Gerard's methods to determine the crippling stress. **(10 Marks)**

6 a. A wing spar has the dimensions shown in Fig. Q6 (a) and carries a uniformly distributed load of 15 KN/m along its complete length. Each flange has a cross sectional area of 500 mm^2 with the top flange being horizontal. If the flanges are assumed to resist all direct loads while the spar web is effective only in shear, determine the flange loads and shear flows in the web sections 1 and 2 from the free end. **(10 Marks)**
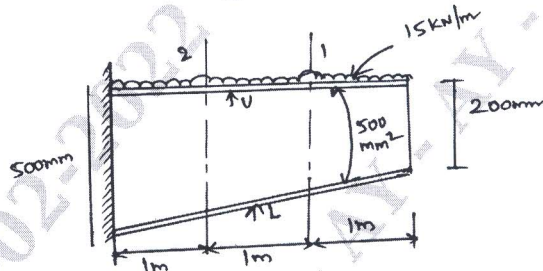

Fig. Q6 (a)

   b. The doubly symmetrical fuselage section shown in Fig. Q6 (b) has been idealized into an arrangement of direct stress carrying booms and shear stress carrying skin panels; all the boom areas are 150 mm^2. Calculate the direct stresses in the booms when the section is subjected to a shear load of 50 KN and a bending moment of 100 KNm. **(10 Marks)**
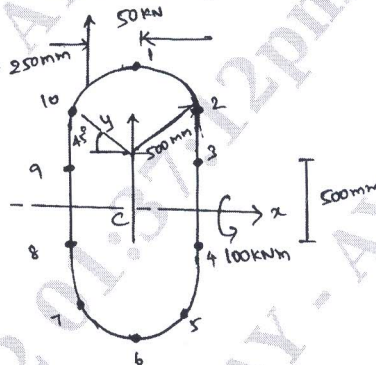

Fig. Q6 (b)

7 a. Write a short note on:
   (i) Wide spread fatigue damage.
   (ii) Two-bay crack criteria. **(10 Marks)**

   b. Explain the life assessment procedures for an aircraft design. **(10 Marks)**

8 a. Explain the general theory for the design fittings with relevant sketches. **(10 Marks)**

   b. Explain the eccentrically loaded connections in bolts and rivets. **(10 Marks)**

* * * * *