Hall Ticket No | | | | | | | | | | |

Course Code **AAE006**

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech IV Semester CIE – II, May – 2018

Regulations: IARE-R16

ANALYSIS OF AIRCRAFT STRUCTURES

Time: 2 Hours **(AE)** **Max Marks: 25**

Answer all question from Part – A
Answer any four questions from Part – B
All parts of the question must be answered in one place only

PART – A

1. (a) Write the value of I_{XY} for unsymmetrical section. [BL: Remember | CO: 2 | Marks: 1]
   (b) Write about air loads. [BL: Understand | CO: 2 | Marks: 1]
   (c) Write the equation to find out the bending stress of idealized panel. [BL: Remember | CO: 7 | Marks: 1]
   (d) If the shear force is 400 N over the length of the 200 mm stiffener, what is the shear flow. [BL: Remember | CO: 9 | Marks: 1]
   (e) Explain the functions of fuselage frames. [BL: Understand | CO: 11 | Marks: 1]

PART – B

2. (a) In order to understand open sections, one has to be clear about centroid, neutral point and shear centre. Explain them with mathematical expression. [BL: Understand | CO: 4 | Marks: 2]
   (b) A beam having the cross section shown in Figure 1 is subjected to a bending moment of 1500 Nm in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts. [BL: Understand | CO: 4 | Marks: 3]

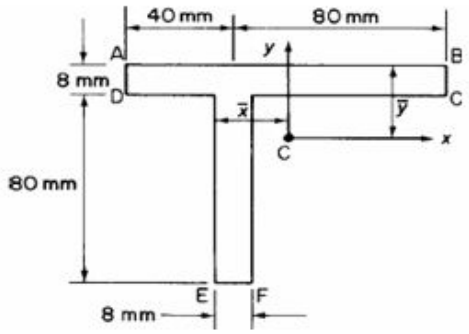

Figure 1

3. (a) Derive the equation to find out the bending stress of idealized panel, if M_y equal to zero with neat sketch. [BL: Understand | CO: 1 | Marks: 2]

(b) Part of a wing section is in the form of the two-cell box shown in Figure 2 in which the vertical spars are connected to the wing skin through angle sections, all having a cross-sectional area of 300 mm2. Idealize the section into an arrangement of direct stress-carrying booms and shear-stress-only-carrying panels suitable for resisting bending moments in a vertical plane. Position the booms at the spar/skin junctions. [BL: Remember | CO: 1 | Marks: 3]

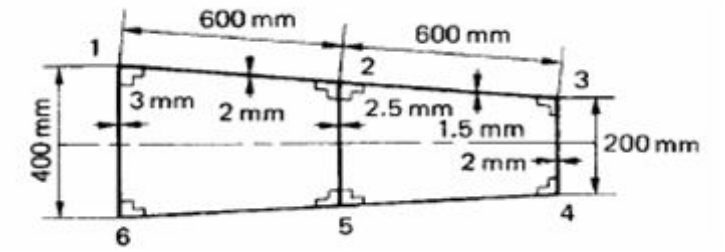

Figure 2

4. (a) Draw the neat sketches of idealized simple wing section. Derive bending stress and shear flow distribution. [BL: Understand | CO: 8 | Marks: 2]

(b) The fuselage section shown in Figure 3 is subjected to a bending moment of 100 kNm applied in the vertical plane of symmetry. If the section has been completely idealized into a combination of direct stress carrying booms and shear stress only carrying panels, determine the direct stress in each boom. [BL: Understand | CO: 8 |Marks: 3]

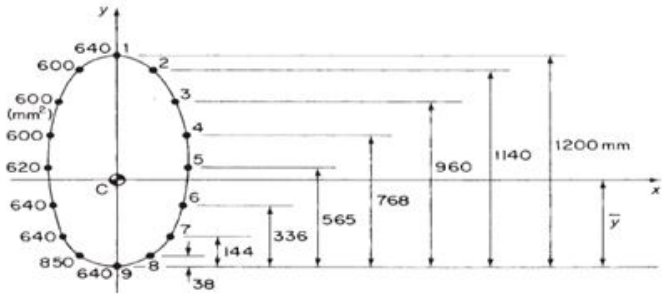

Figure 3

5. (a) Explain torsion on three boom shell with neat sketch. [BL: Understand | CO: 8 | Marks: 2]

(b) The beam shown in Figure 4 is simply supported at each end and carries a load of 6000 N. If all direct stresses are resisted by the flanges and stiffeners and the web panels are effective only in shear, calculate the distribution of axial load in the flange ABC and the stiffener BE and the shear flows in the panels. [BL: Understand | CO: 8 |Marks: 3]

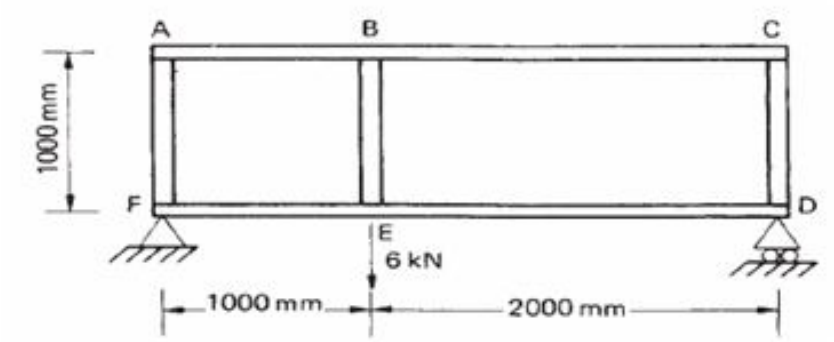

Figure 4

6. (a) Derive the equation to find out shear flow in a tapered wing.

[BL: Understand | CO: 11 | Marks: 2]

(b) If the web in the wing spar of Figure 5 has a thickness of 2mm and is fully effective in resisting direct stresses, calculate the maximum value of shear flow in the web at a section 1m from the free end of the beam. [BL: Understand | CO: 8 |Marks: 3]

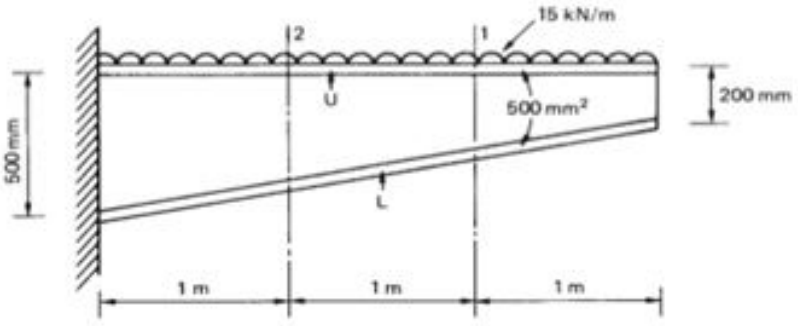

Figure 5