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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE 2018

SUBJECT: AIRCRAFT DESIGN-II [AAE 3201]

REVISED CREDIT SYSTEM

(11/06/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Derive the shear flow at a particular point equation for open section beams **(05)**

1B. Calculate the shear flow distribution in the channel section shown in figure 1B produced by a vertical shear load of 4.8kN acting through its shear center. Assume that the walls of the section are only effective in resisting shear stress while the booms, each of area 300 mm^2, carry all the direct stresses. **(05)**

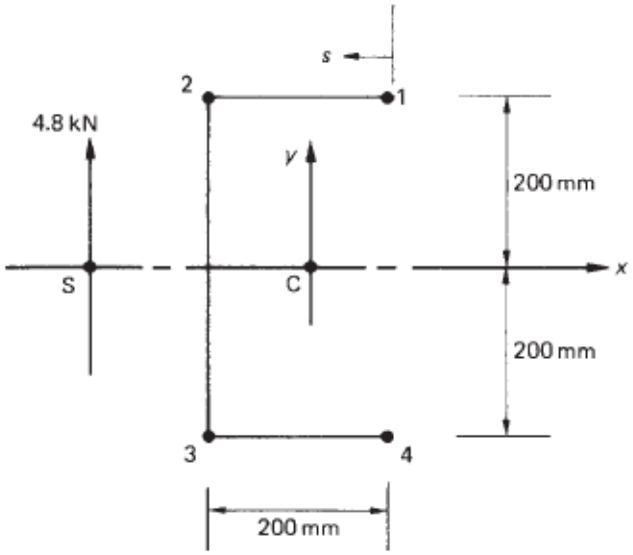

Figure 1B

2A. Derive the unknown stress and load equations for tapered closed section beams **(05)**

2B. Explain in detail about internal structural parts inside a wing and classification of wing according to this. **(05)**

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3A. Determine the shear flow distribution in the web of the tapered beam shown in figure 3A at a section midway along its length. The web of the beam has a thickness of 2mm and its fully effective in resisting direct stress. The beam tapers symmetrically about its horizontal centroidal axis and the cross sectional areas each of the flange is 400 mm^2.

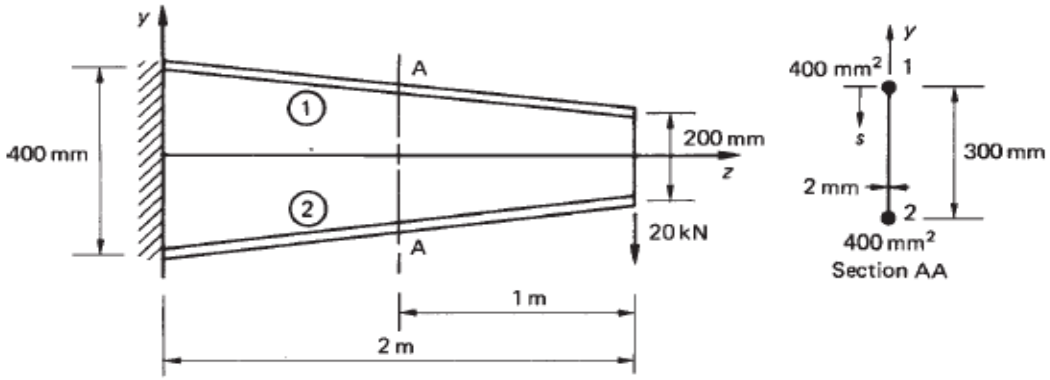

Figure 3A

3B. Part of a wing section is in the form of the two-cell box shown in figure 3B which the vertical spars are connected to the wing skin through angle sections all having a cross sectional area of 600mm^2. 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. **(05)**

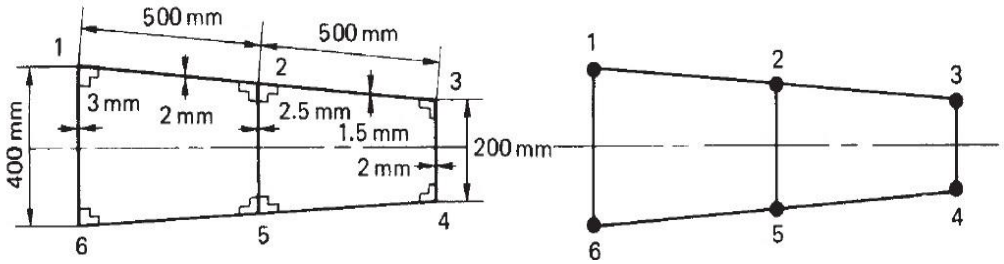

Figure 3B

4A. The cantilever beam shown in Figure 4A is uniformly tapered along its length in both x and y directions and carries a load of 140kN at its free end. Calculate the forces in the booms and the shear flow distribution in the walls at a section 2m from the root if the booms resist all the direct stresses while the walls are effective only in shear. Each corner boom has a cross-sectional area of 400mm^2 while both central booms have cross sectional areas of 900mm^2 **(06)**

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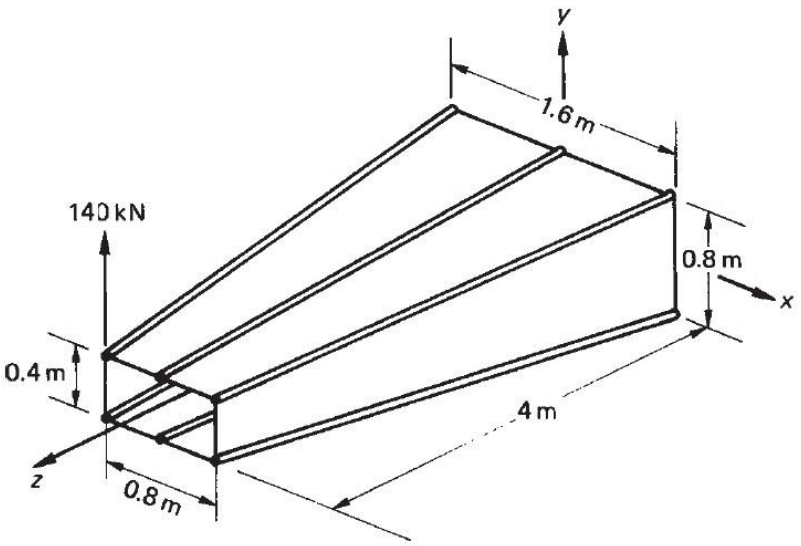

Figure 4A

4B. Explain in detail about internal structural parts inside a fuselage and classification of fuselage according to this. **(04)**

5A. A beam having the cross-section shown in figure 5A is subjected to a bending moment of 1500Nm in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts **(05)**

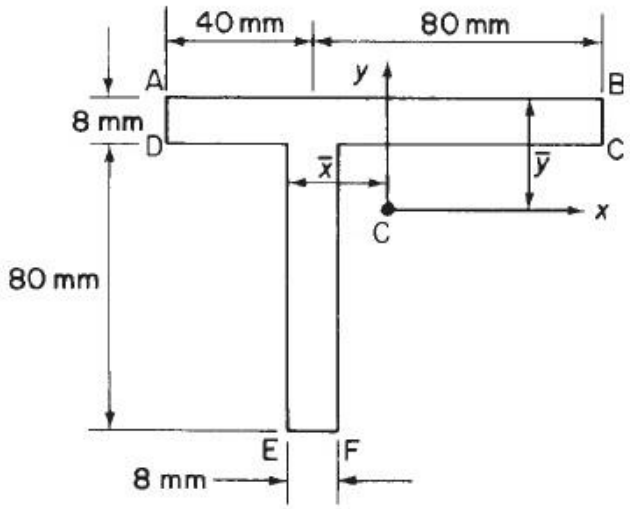

Figure 5A

5B. The fuselage section shown in figure 5B is subjected to a bending moment of 120 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. **(05)**

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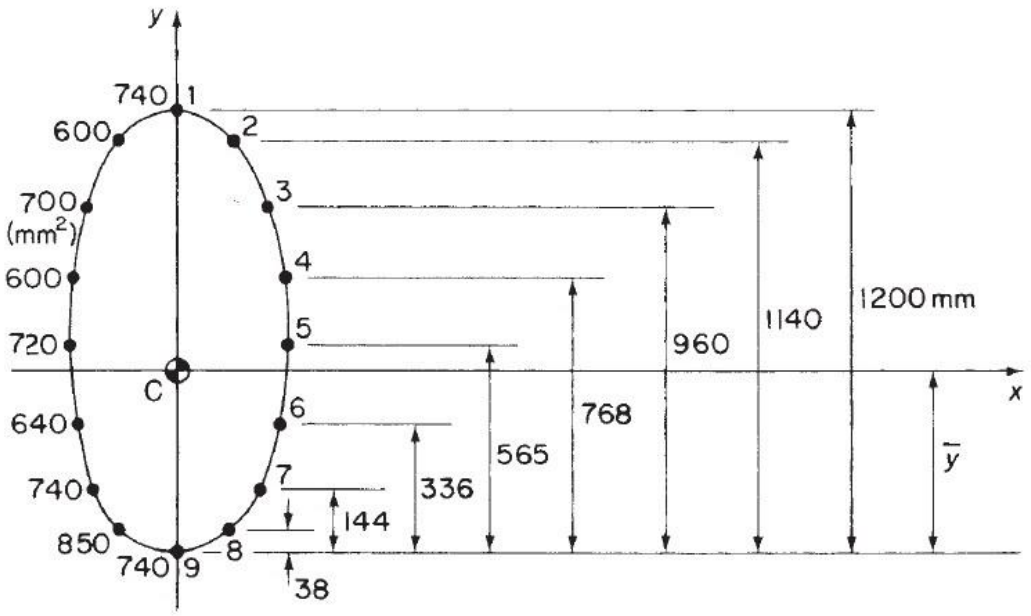

Figure 5B