Code No: R05412103 **R05** **Set No. 2**

IV B.Tech I Semester Examinations,November 2010
STRUCTURAL ANALYSIS AND DETAILED DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the phenomenon of calculating the bending moments in ribs of a wing. [16]

2. (a) How is the structural idealization helpful for analysis of structures?
   (b) A wing section is in the form of the two-cell box shown in Figure 1 in which the vertical spars are connected to the wing skin through angle sections all having a cross-sectional area of 300mm^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. Position the booms at the spar/skin junctions. [16]

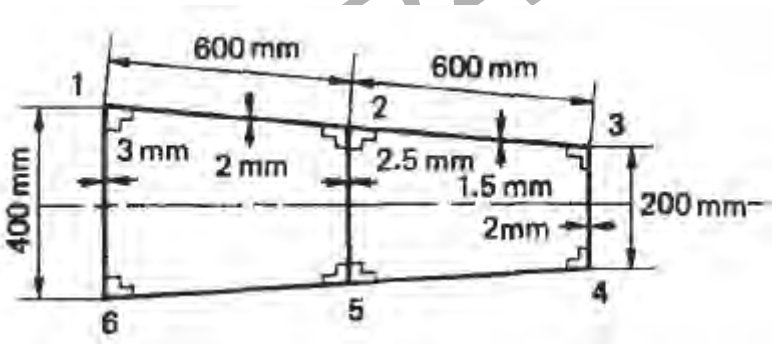

Figure 1:

3. (a) Explain buckling of a circular cylinder under pure torsion with Internal pressure & under Transverse shear and Internal pressure.
   (b) A cylinder has length (L) 2000 mm, radius (r) 1400 mm and wall thickness (t) =1.3 mm, $\mu = 0.3$. Find the geometrical parameter(z). [12+4]

4. A steel ship deck plate is 30mm thick, as shown in figure 2 loaded with a normal tensile stress of 50MPa.
   It is operated below its ductile to brittle transition temperature with K_{IC} equal to $28.3MPa\sqrt{m}$. If a 65 mm long central hole transverse crack is present, estimate tensile stress at which catastrophic failure will occur. Compare this stress with the yield strength of 240 MPa for the steel. [16]

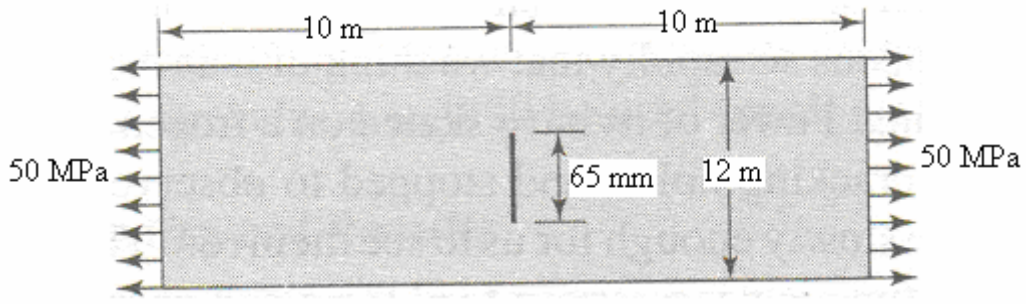

Figure 2

5. A round steel tube with 25 mm outer diameter (OD) 1.65mm thick resists a design torsional moment of 0.56kN-m. Find the margin of safety if the ultimate tensile stress $\sigma_{tu} = 690$ N/mm^2. [16]

6. An aircraft of length 10 m having a total weight of 45 kN lands on the deck of an aircraft carrier and is brought to rest by means of a cable engaged by an arrester hook, as shown in Fig 3. If the deceleration induced by the cable is 3g, determine the tension, T, in the cable, the load on an undercarriage strut and the shear and axial loads in the fuselage at the section AA located 6 m from the nose of the aircraft. The weight of the aircraft aft of AA is 4.5 kN. Calculate also the length of deck covered by the aircraft before it is brought to rest if the touchdown speed is 25 m/s. [16]

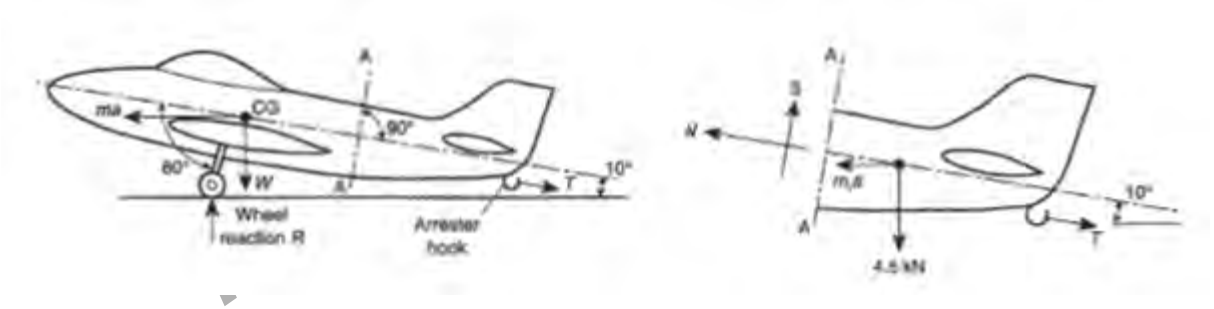

Figure 3:

7. Find the forces (CD, C_V, C_D, B_V, A_V, B_D, A_D) in each member of main landing gear shown in Fig 4. Assume additional data if necessary. [16]

8. A cantilever beam of constant cross-section carries a 60kN load at the free end as shown in figure 5. Carry out the strength check of the beam for the given load. The material properties are:

   Web: 2024-T3 al.sheet. $F_{tu} = 442$, $F_{ty} = 290$, E = 72500.
   Flanges : 7075-T6 al. alloy extruded.
   $F_{tu} = 538$, $F_{cy} = 486$, E = 71000. [16]

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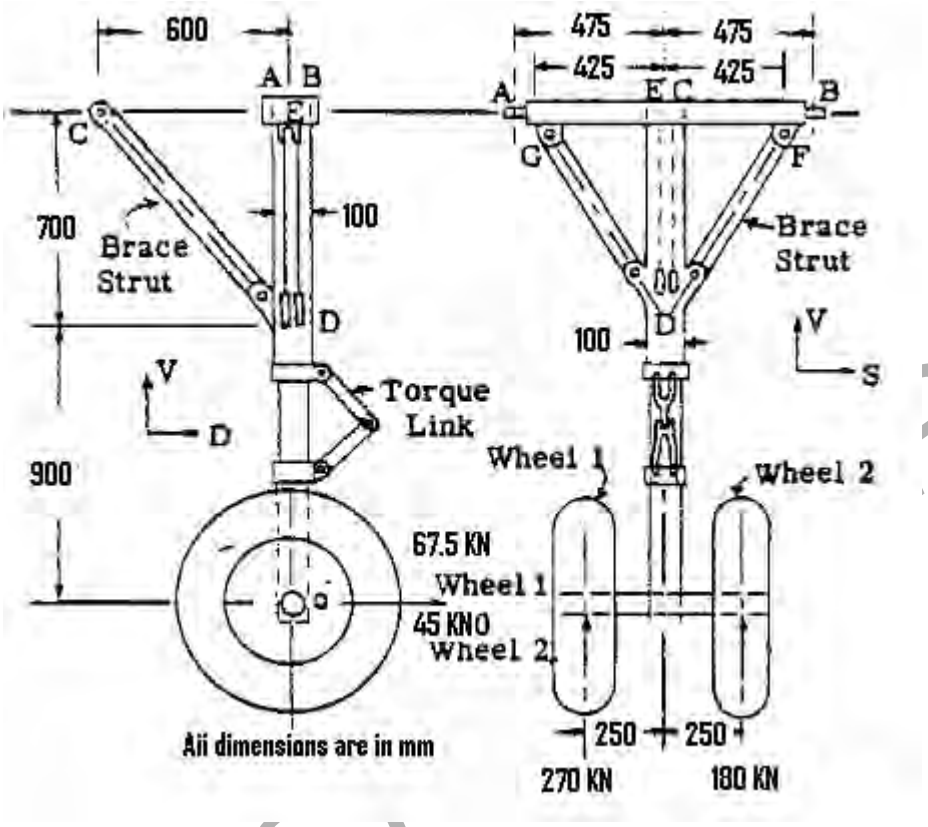

Figure 4:

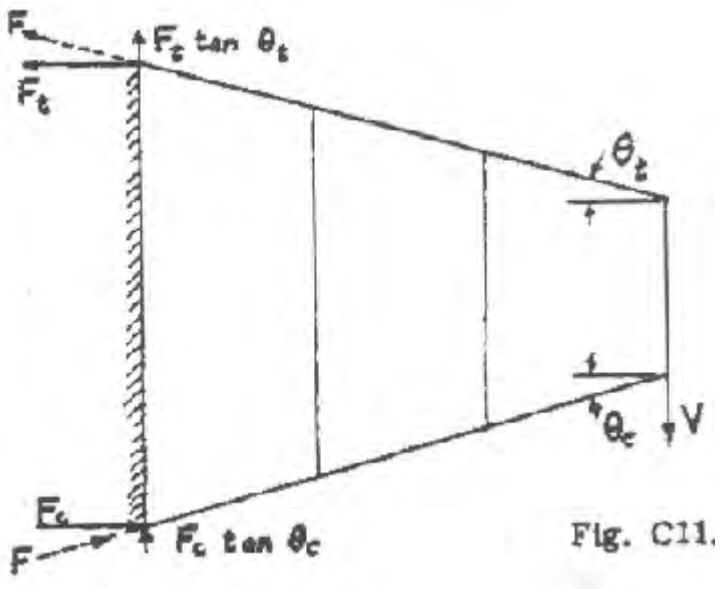

Figure5:

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Code No: R05412103 **R05** **Set No. 4**

IV B.Tech I Semester Examinations,November 2010
STRUCTURAL ANALYSIS AND DETAILED DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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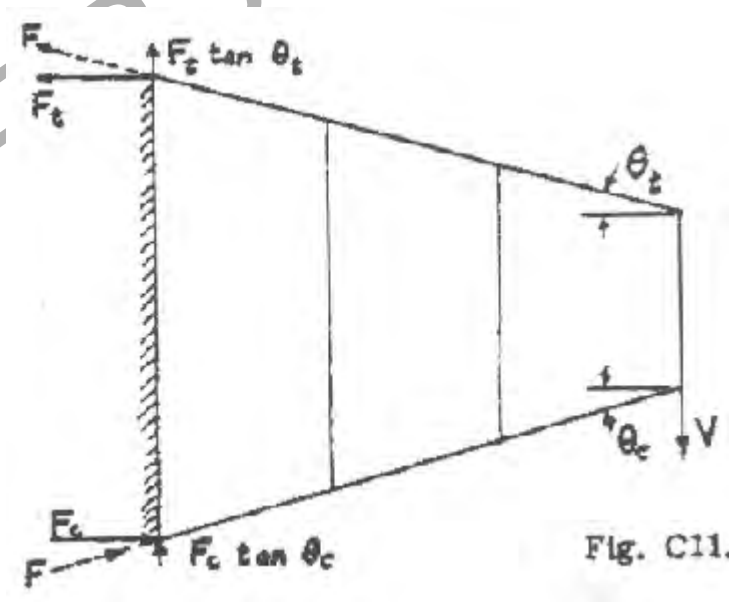

Figure 1:

4. Find the forces (CD, C_V, C_D, B_V, A_V, B_D, A_D) in each member of main landing gear shown in Fig 2. Assume additional data if necessary. [16]

Code No: R05412103 **R05** **Set No. 4**

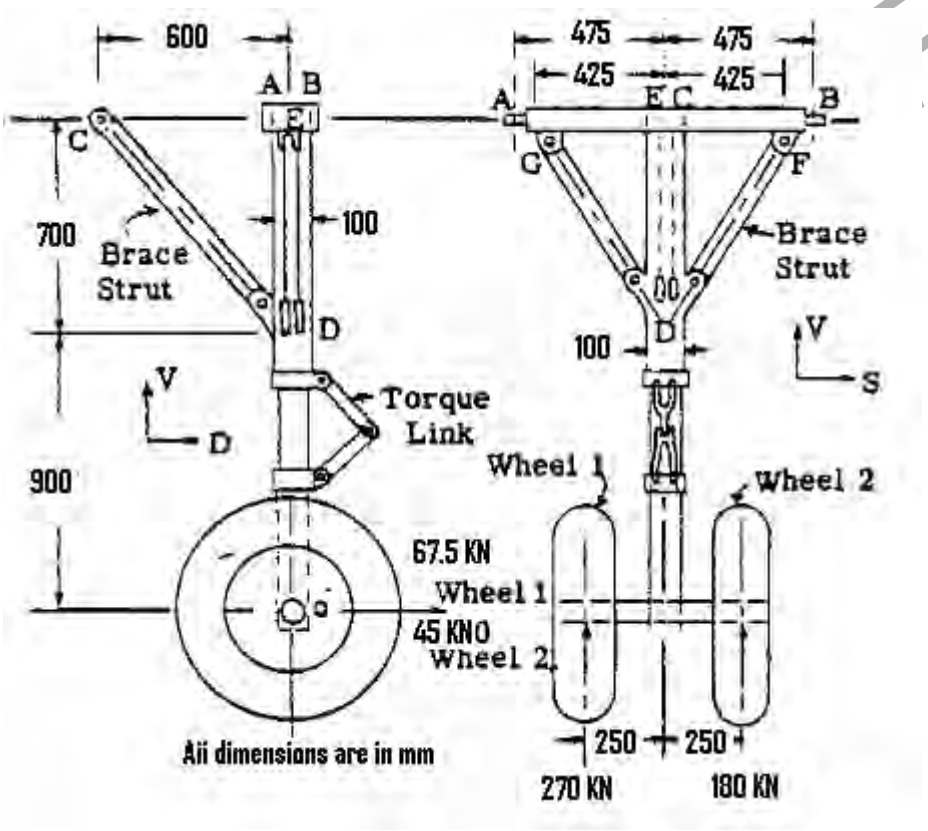

Figure 2:

5. An aircraft of length 10 m having a total weight of 45 kN lands on the deck of an aircraft carrier and is brought to rest by means of a cable engaged by an arrester hook, as shown in Fig 3. If the deceleration induced by the cable is 3g, determine the tension, T, in the cable, the load on an undercarriage strut and the shear and axial loads in the fuselage at the section AA located 6 m from the nose of the aircraft. The weight of the aircraft aft of AA is 4.5 kN. Calculate also the length of deck covered by the aircraft before it is brought to rest if the touchdown speed is 25 m/s. [16]

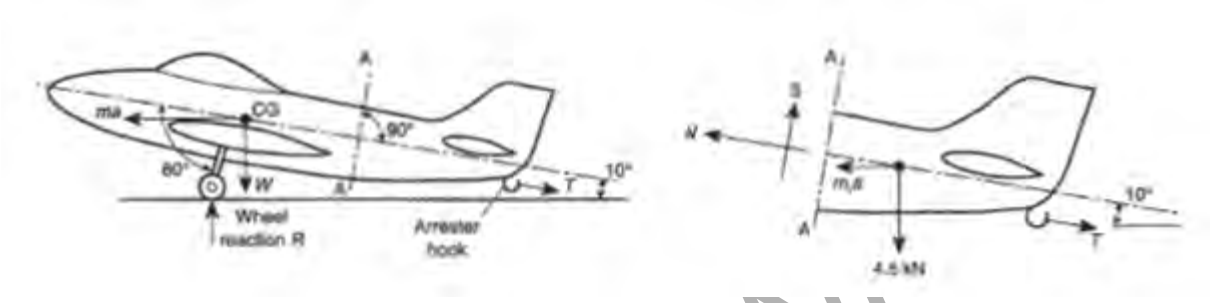

Figure 3:

6. A steel ship deck plate is 30mm thick, as shown in figure 4 loaded with a normal tensile stress of 50MPa.
It is operated below its ductile to brittle transition temperature with K_{IC} equal to $28.3MPa\sqrt{m}$. If a 65 mm long central hole transverse crack is present, estimate tensile stress at which catastrophic failure will occur. Compare this stress with the yield strength of 240 MPa for the steel. [16]

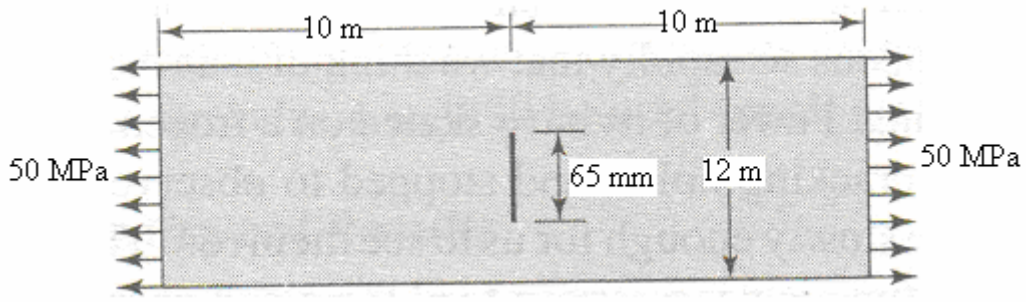

Figure 4:

7. (a) How is the structural idealization helpful for analysis of structures?
   (b) A wing section is in the form of the two-cell box shown in Figure 5 in which the vertical spars are connected to the wing skin through angle sections all having a cross-sectional area of $300mm^2$. 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. Position the booms at the spar/skin junctions. [16]

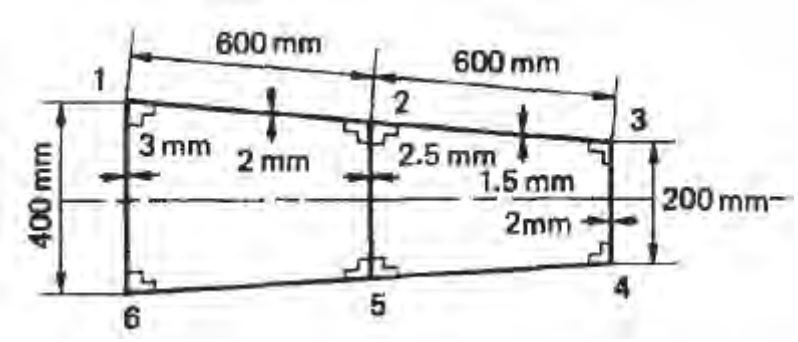

Figure 5:

8. (a) Explain buckling of a circular cylinder under pure torsion with Internal pressure & under Transverse shear and Internal pressure.

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Code No: R05412103 **R05** **Set No. 1**

IV B.Tech I Semester Examinations,November 2010
STRUCTURAL ANALYSIS AND DETAILED DESIGN
Aeronautical Engineering

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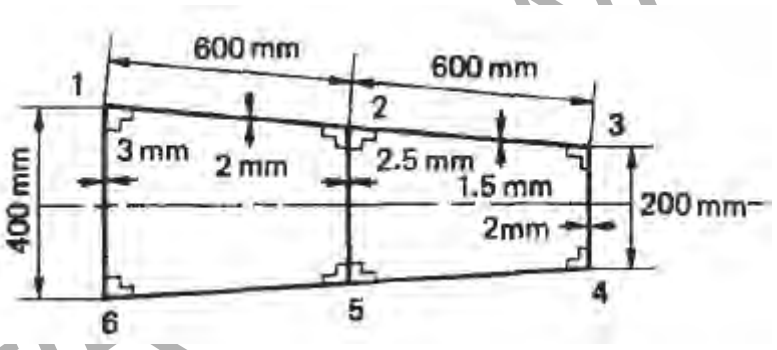

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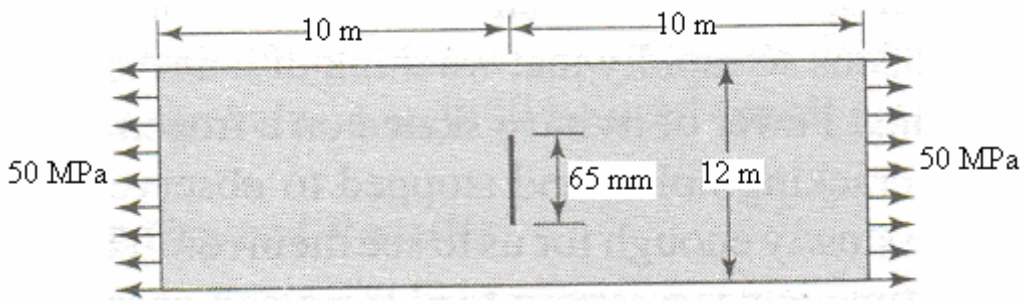

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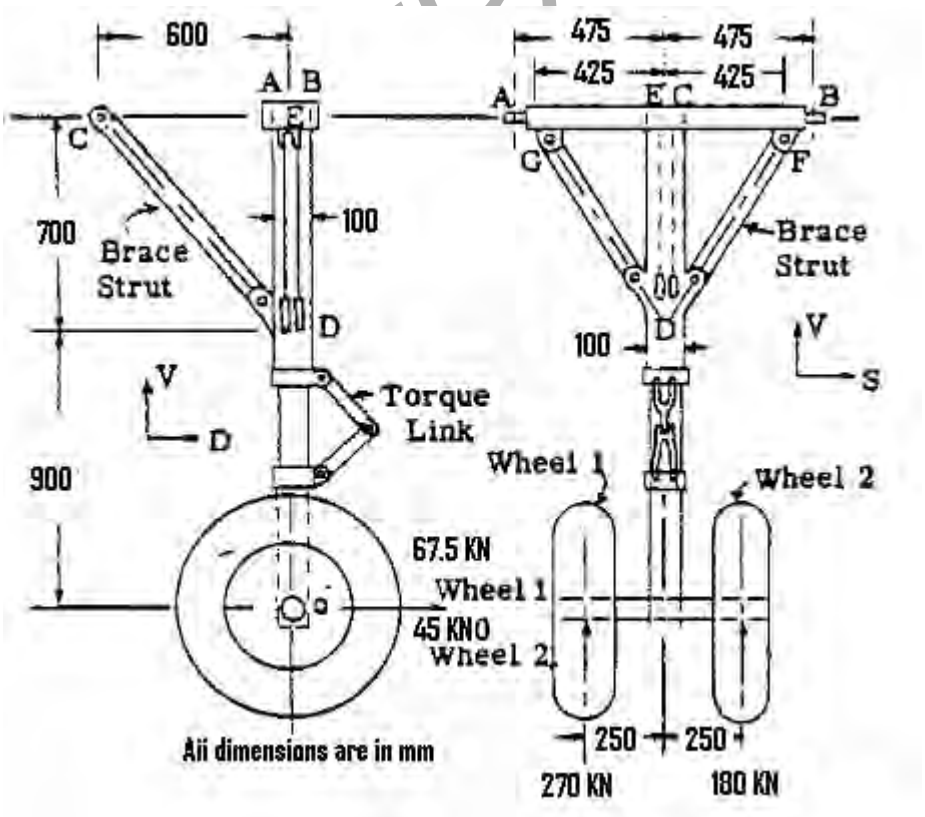

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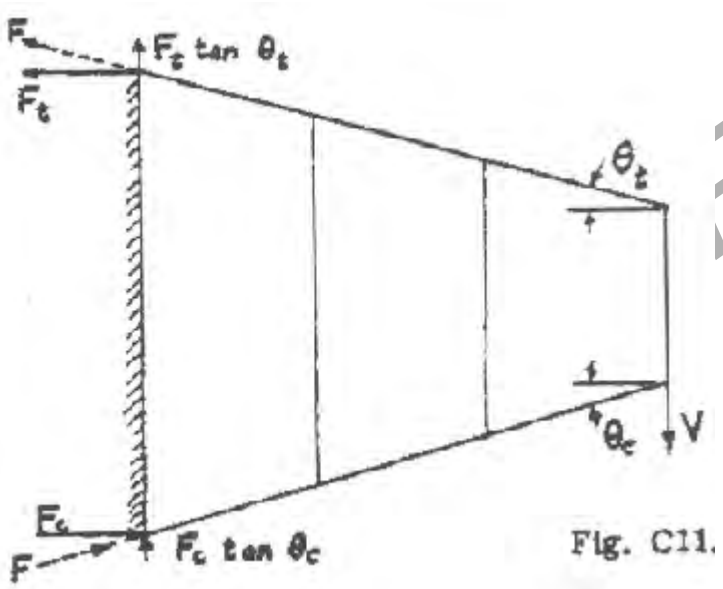

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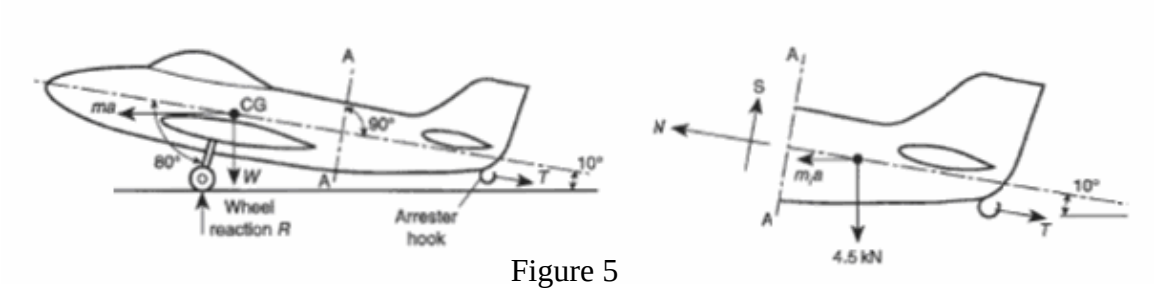

Figure 5

8 . A round steel tube with 25 mm outer diameter (OD) 1.65mm thick resists a design torsional moment of 0.56kN-m. Find the margin of safety if the ultimate tensile stress σ_{tu} = 690 N/mm^2. [16]

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Code No: R05412103 **R05** **Set No. 3**

IV B.Tech I Semester Examinations,November 2010
STRUCTURAL ANALYSIS AND DETAILED DESIGN
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

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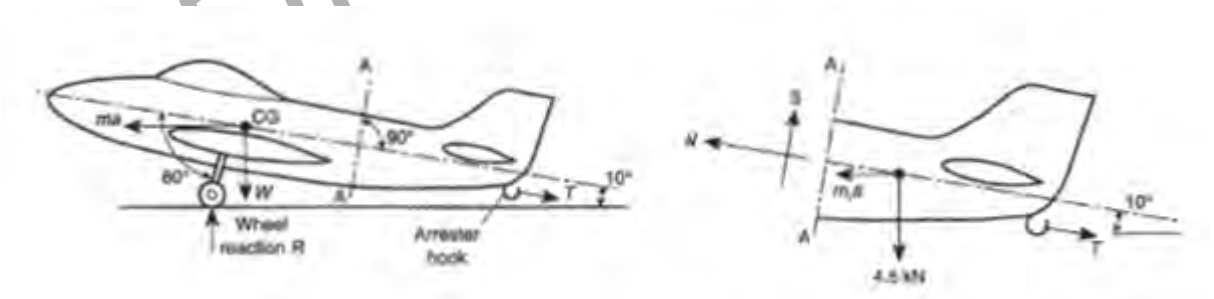

Figure 1:

Code No: R05412103 **R05** **Set No. 3**

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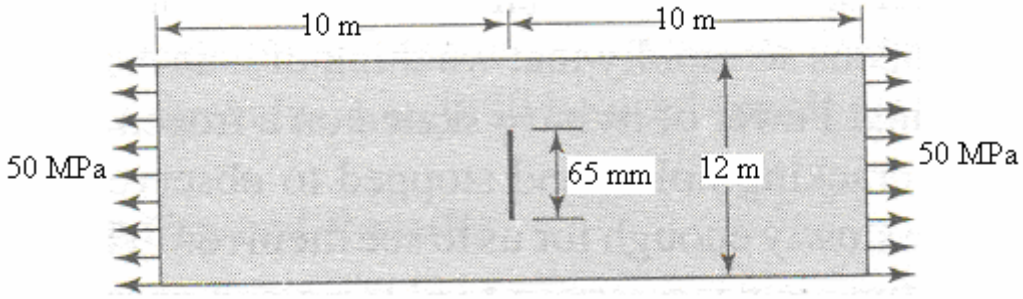

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5. (a) How is the structural idealization helpful for analysis of structures?
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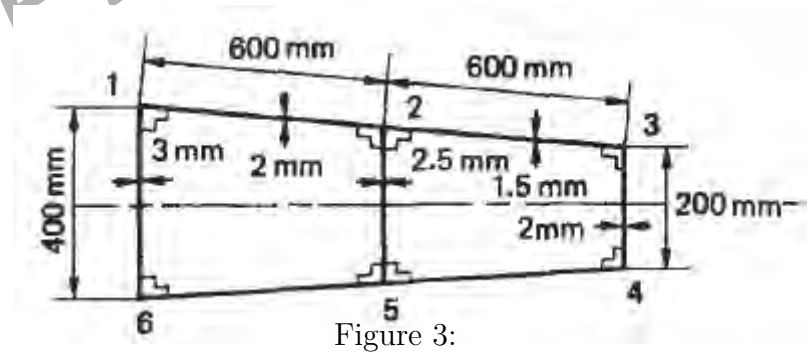

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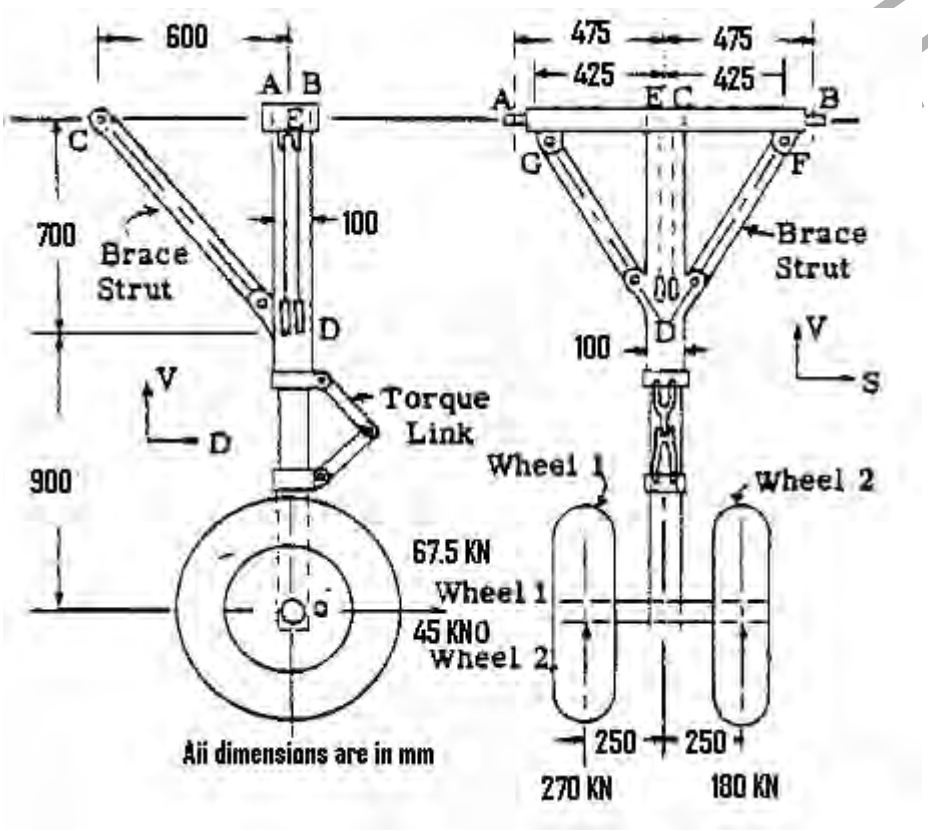

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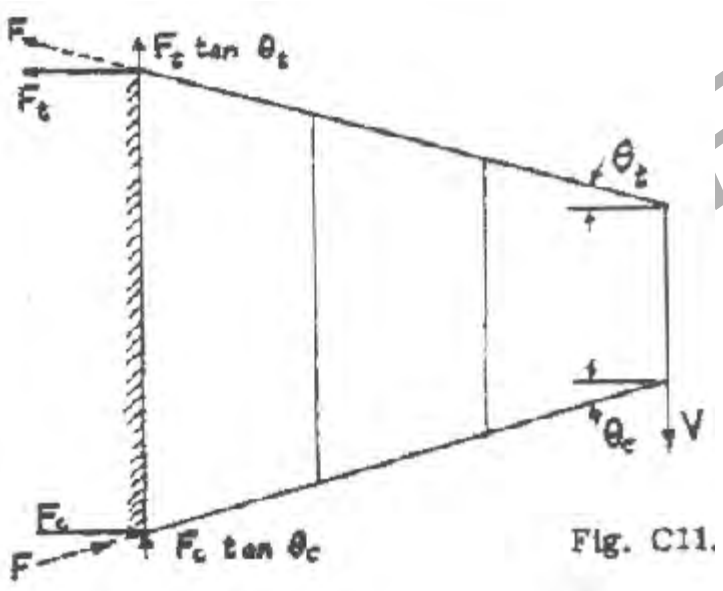

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