Code No: RR312105 **Set No. 1**

III B.Tech I Semester Supplimentary Examinations, May/Jun 2009
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Explain in detail the boundary conditions for various kinds of beams with neat sketches in terms of slopes and deflections. [16]

2. A cantilever beam of span L is subjected to uniform varying load 'w' per unit width, varying from zero at the free end to maximum at the fixed end followed by a clock wise couple, M at the free end. Find the slope and deflection at the free end using method of super position, assuming uniform flexural rigidity, EI. [16]

3. A statistically indeterminate system is shown in (figure3) for a propped cantilever. Find the prop reaction at C. Find the net downward deflection [16]

   E=2×10^5N/mm^2

   I=1000×10^4 mm^4

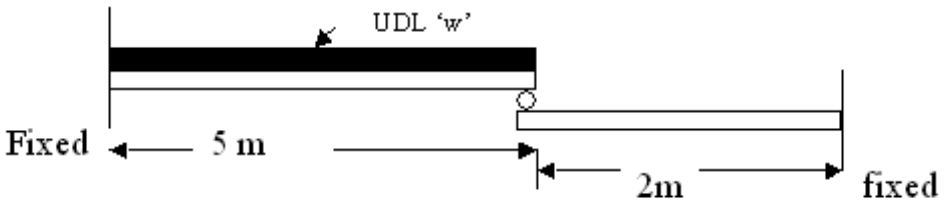


Figure 3

4. A frame is loaded as shown in (figure4) at point D. Determine the vertical deflection using Strain energy method. [16]

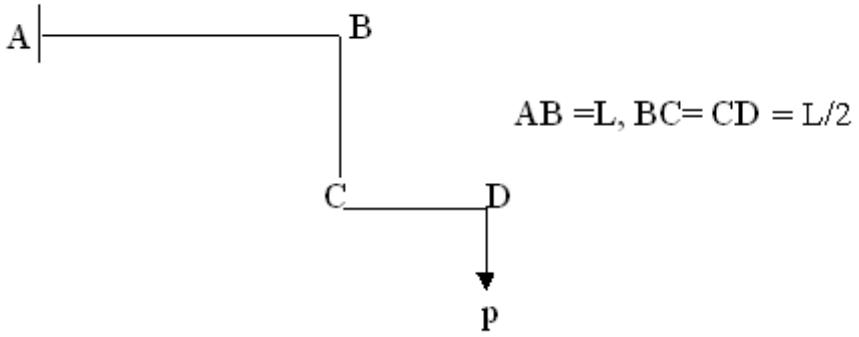


Figure 4

5. Find the deflection and slope using unit load method at the free end of a cantilever beam loaded as shown in figure5, assuming uniform flexural rigidity, EI. [16]

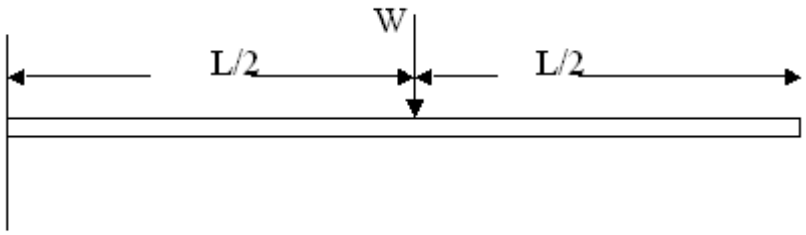


Figure 5

6. A column having a T-section with a flange 120mmX16mm and web 150X16mm is 3 m long. Assuming the column to be hinged at both ends. Find the crippling load by Euler's formula.
   E=$2\times10^5 N/mm^2$ [16]

7. Compare the crippling loads given by Rankine's formula and Euler's Formula for a tubular strut having outer and inner diameters as 37.5 mm And 32.5 mm respectively loaded through pin joints at both ends. The critical stress is 32.5 KN/cm^2. k_1= 1/7500 E = 2$\times$ 10^5 N/mm^2. [16]

8. A beam-column of span L, which fixed at both the ends is subjected to axial compressive load P at the ends followed by a transverse UDL 'w' per unit length over the entire span

   (a) Write the beam column equations considering buckling at a section

   (b) Give the boundary conditions. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR312105 **Set No. 2**

III B.Tech I Semester Supplimentary Examinations, May/Jun 2009
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Two cantilever beams AB and CD of equal length 4000 mm of equal flexural rigidity EI=$24\times10^{12} Nmm^2$ are fixed to a wall (AB above CD) in vertical plane horizontally and are inter connected by a steel rod BD (E=200Gpa) to the free ends B and D. Rod BD is 5000mm long and has a cross-sectional area of 300mm^2. Find the deflection of cantilever AB at B due to a downward force of P=50 KN applied at D considering the elongation of the rod. [16]

2. A simple supported flitched beam (composite) of span 2m carries a U.D.L of 10 KN/m over its entire span. The beam is made of aluminum 100× $50mm_2$ reinforced with steel plates 50×10 mm^2 . Determine the maximum deflection and slope for the composite beam. E_{steel} = 3.5× E_{wood}. E_{steel} = 2×10_5 N/mm^2. [16]

3. A SSB of span L is carrying a UDL,'w' over its entire length and propped at the center. Find the prop reaction and draw the SFD and BMD. [16]

4. Determine the deflection under 60 KN load for the beam ACB shown in figure4 using Castiglino's theorem E=2×10^5N/mm^2 [16]

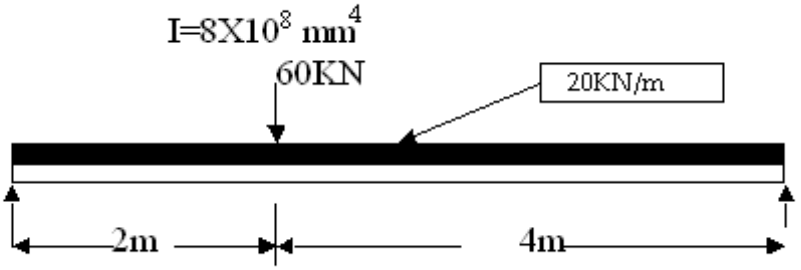


Figure 4

5. Find the forces in all the members of the structure and tabulate the results as shown in figure below 5. [16]

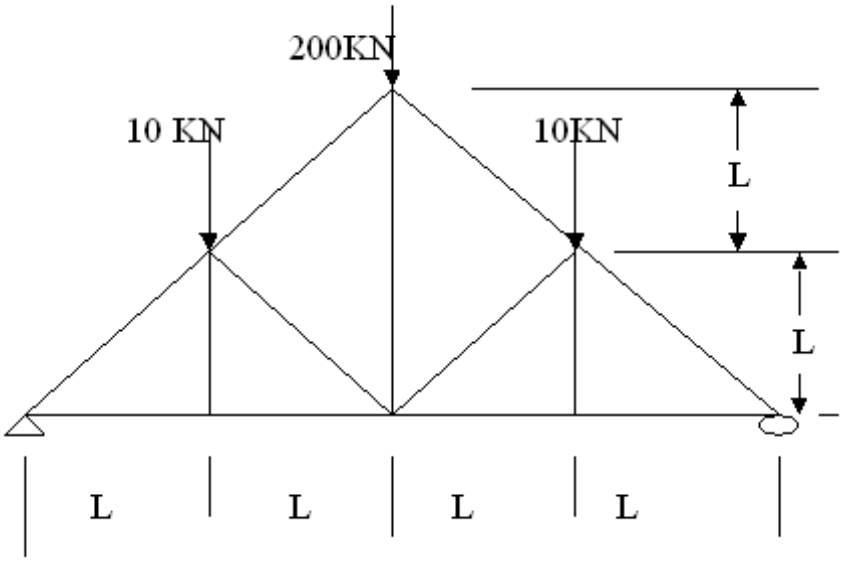


Figure 5

6. Derive Euler critical load formula for a column with one end fixed ,other end hinged. [16]

7. A cast iron of hollow circular section 200mm external dia ,thickness of metal 20mm,length 5m,has to take a load of 120 KN at an eccentricity of 20 mm from the geometrical axis. If the ends are fixed, calculate max. and min. stresses induced in the section taking E=120 KN/mm^2 .Also calculate max. permissible eccentricity so that no tension is induced anywhere in the section. [16]

8. A beam column of span L, which is fixed at both ends is subjected to moment M, at a distance L/3 from right end, followed by axial compressive load P,

   (a) Write the beam column equations for buckling at a section

   (b) Give the boundary conditions. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR312105 **Set No. 3**

III B.Tech I Semester Supplimentary Examinations, May/Jun 2009
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A cantilever beam of 20 cm wide and 40 cm thick with 5m is loaded with a U.D.L of 800N/m extending over a span of 3m from the free end Find the deflection at the free end using double integration method.
   I = $16000 \times 10^4 mm^4$ E = $2 \times 10^5 N/mm^2$ [16]

2. A cantilever beam of span 4 m is loaded with a u.d.l. of 50 KN/m over its entire span and a point load of 10 KN at its free end. Determine the maximum deflection and slope using superposition method.
   I = $1.4 \times 10^7 mm^4$. E = $2 \times 10^5 N/mm^2$ [16]

3. A cantilever of span 4m carries a point load 10KN at its free end .It is propped at 1m from the free end. Find the prop reaction at the support. [16]

4. State Castiglino's theorem for deflection of beams. Derive Castiglino's theorem. [16]

5. Find the forces in all the members of the structure and tabulate the results as shown in figure below 5. [16]

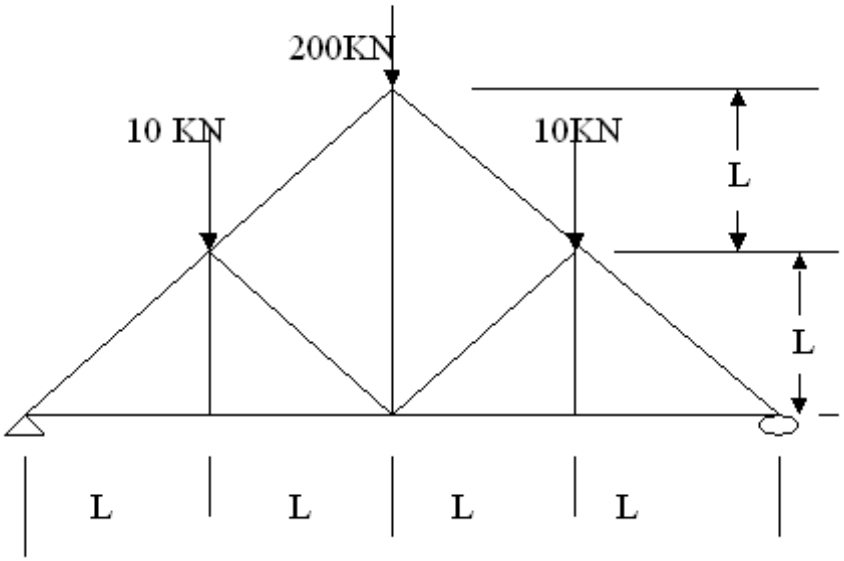


Figure 5

6. (a) Define the following terms: Columns, Buckling, Crippling load.
   (b) What are the assumptions made in Euler's theory of columns? [16]

7. A short cast iron column is tubular in section having 250 mm external Diameter and 200 internal diameter.
   The column carries an eccentric load of 250 KN at a point distant 100 from its axis. Determine the maximum tensile and compressive stresses. Also draw the stress distribution. [16]

8. A beam-column of span L, which is hinged at one end and roller supported at the other end is subjected to axial compressive load P, at the ends followed by a clockwise couple M at the center

   (a) Write the beam column equations considering buckling at a section

   (b) Give the boundary conditions. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR312105 **Set No. 4**

III B.Tech I Semester Supplimentary Examinations, May/Jun 2009
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Two cantilever beams AB and CD of equal length 4000 mm of equal flexural rigidity EI=$24\times10^{12} Nmm^2$ are fixed to a wall (AB above CD) in vertical plane horizontally and are inter connected by a steel rod BD (E=200Gpa) to the free ends B and D. Rod BD is 5000mm long and has a cross-sectional area of 300mm^2. Find the deflection of cantilever AB at B due to a downward force of P=50 KN applied at D considering the elongation of the rod. [16]

2. A cantilever beam of span 4 m is subjected to UDL of 20 KN/m over a span of 2m from the free end and a clock wise couple of 2 KN-m at the free end . Find the slope and deflection at the free end using the method of superposition. EI = $3\times10^{14} N-mm^2$ [16]

3. A continuous beam with one end fixed is supported at B and C and loaded as shown in figure3. Find the end reactions as well as moments. EI = 2×10^{13}N/mm^2 [16]

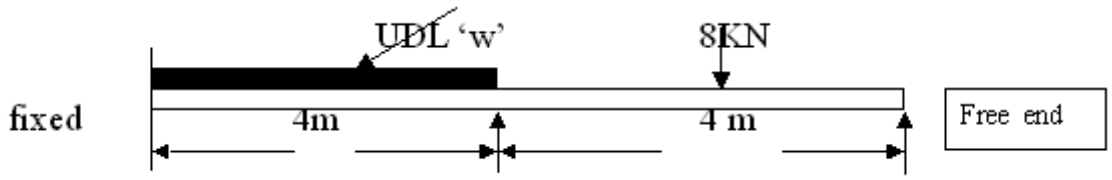


Figure 3

4. AB = BC = 3m each AB is UDL of 3KN/m . At B point load of 60KN A cantilever beam is loaded as shown in figure4. Find the deflecton at B using Castiglino's theorem.
EI = 2×10^{14} Nmm^2 [16]

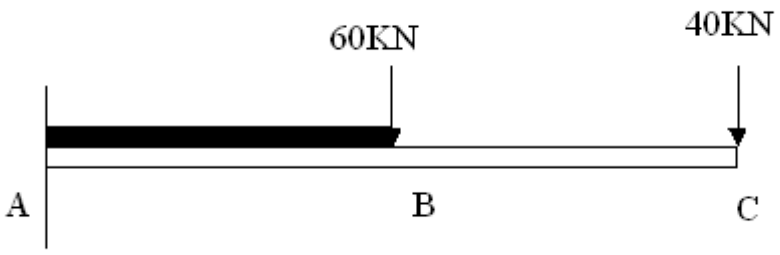
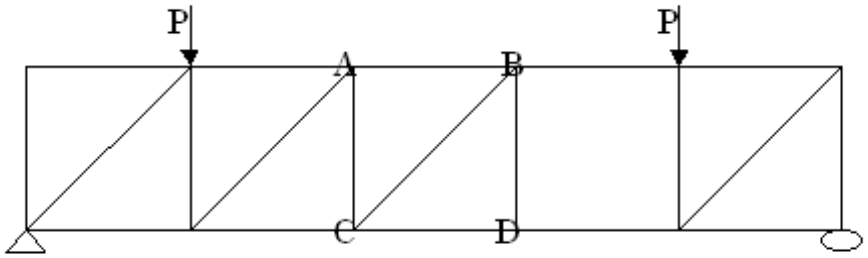


Figure 4

5. All the horizontal and vertical members are of equal length, L A truss is loaded as shown in figure5 .Find the forces in the members AB,BC,CD and their nature and tabulate the forces. [16]



[

Figure 5

6. (a) Define the following terms: Columns, Buckling, Crippling load.
   (b) What are the assumptions made in Euler's theory of columns? [16]

7. A cast iron of hollow circular section 200mm external dia ,thickness of metal 20mm,length 5m,has to take a load of 120 KN at an eccentricity of 20 mm from the geometrical axis. If the ends are fixed, calculate max. and min. stresses induced in the section taking E=120 KN/mm^2 .Also calculate max. permissible eccentricity so that no tension is induced anywhere in the section. [16]

8. A beam column of span L, which is fixed at both ends, is subjected to uniform varying transversely 'w' per unit width and axial compressive load, P at the ends
   (a) Write the beam column equation for buckling at a section
   (b) Give the boundary conditions. [16]

⋆ ⋆ ⋆ ⋆ ⋆