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

III B.Tech. I Semester Regular Examinations, November -2005
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A cantilever beam of span L is subjected to uniformly varying loading , w per unit width. Find the slope and deflection at the free end using double integration method. Assume uniform flexural rigidity. [16]

2. (a) Explain the flexure equation of bending
   (b) derive shear force and UDL, 'w'from flexure equation
   [16]

3. A fixed beam of 3m span is subjected multiple point loads of 10KN from both ends at a distance of 1m. Find the end reactions and fixing moments Draw free, fixing and net moment diagrams. [16]

4. Determine the vertical deflection under 80 KN load for the beam shown in figure1 using Castiglino's theorem
   E=2X10^{5}N/mm^2. [16]

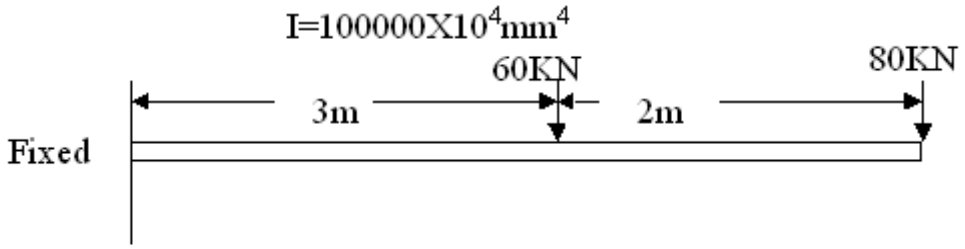

Figure 1:

5. Find the deflection at center, C using unit load method. shown in Figure 2.
   E=2X10^{5}N/mm^2
   I=4X10^{7}mm^4 [16]

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$\times$10$^5 N/mm^2$ [16]

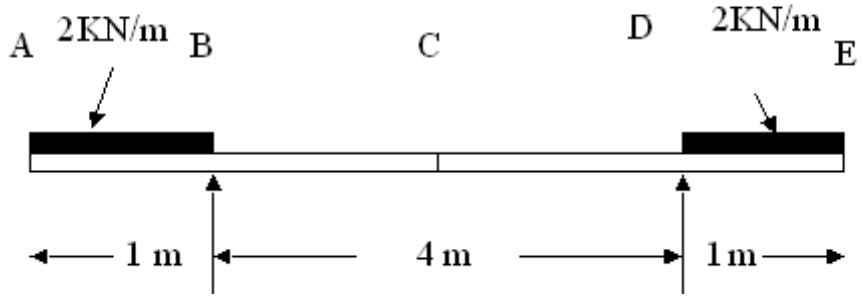

Figure 2:

7. Two long columns having equal length and similar end conditions are of circular cross-section, one solid and the other hollow. Bothe the columns are of the same material and equal weight and the external radius of the hollow column is twice its internal radius. Compare the critical loads for both the columns. [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 transverse UVL 'w' per unit length over the entire span

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

   (b) Give the boundary conditions [16]

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

III B.Tech. I Semester Regular Examinations, November -2005
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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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 6 m is subjected to a point load of 40 KN at a distance 4 from the fixed end and a anti clock wise moment of 10 KN-m at the free end. Find the slope and deflection at the free end using superposition method. EI = $3\times10^{14}Nmm^2$ [16]

3. A simply supported beam of span L with uniformly distributed load ,w is propped at its midpoint .Find the prop reaction at that point. Draw shear force and Bending moment diagrams. [16]

4. A vertical load w is applied to the rigid cantilever frame AB = L,BC = L/2 fixed at A as shown in figure3. Assuming uniform flexural rigidity through out the frame determine the horizontal and vertical displacements of the point C. Neglect axial deformations. [16]

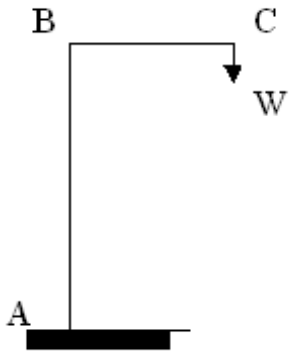

Figure 3:

5. A SSB is loaded at C as shown in Figure 4. Find the deflection and slope using unit load method at C.
E=2X10^{5}N/mm^2
I=4X10^{7}mm^4 [16]

6. (a) What is the effective length of a column for various end conditions.
   (b) What is the slenderness ratio for a column and explain the limitations of Euler's theory with the help of Euler's curve. [16]

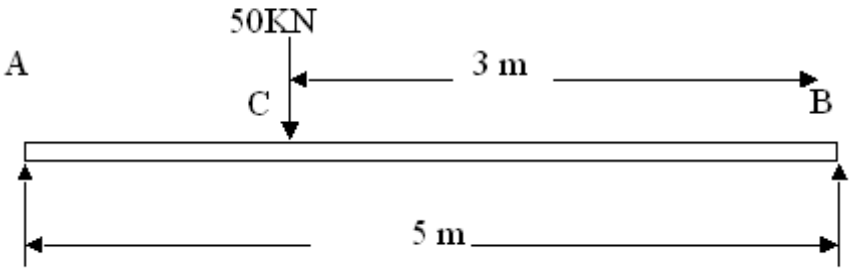

Figure 4:

7. An I section of length 3 m deflects by 6.35 mm under a central point load of 10.16 KN, wen siple supported as a beam. Find the critical load when used as a column with both ends hinged. The section properties are I_{xx} = 468. 8×10^4 mm^4 I_{yy}= 58.6×10^4 mm^4 . [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 transverse load 'Q' at a distance 'a' from the fixed end

   (a) Write the beam column equations considering buckling at section on both sides of Q from roller support end

   (b) Give the boundary conditions. [16]

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

III B.Tech. I Semester Regular Examinations, November -2005
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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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 simply supported beam of span 4 m is subjected to a point of 30 KN at the center and a end couple of 2 KN-m . Find the Maximum deflection and slope at the ends.
   EI = $2 \times 10^{14} N - mm^2$ [16]

3. A fixed beam of 3m span is subjected multiple point loads of 10KN from both ends at a distance of 1m. Find the end reactions and fixing moments Draw free, fixing and net moment diagrams. [16]

4. Determine the vertical and horizontal deflections at free end C of a cantilever frame shown in figure5 using Castiglino's theorem. Neglect the effect of axial deformations. Assume uniform flexural rigidity,EI. [16]

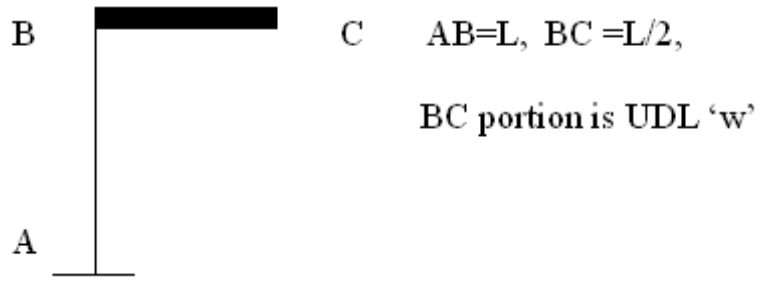

Figure 5:

5. An overhang beam supported at A and C with over hang portion CD is loaded as shown in Figure 6 . Find the deflection using unit load method at the free end D.
   I=$2X10^8 mm^4$
   E=$2X10^5 N/mm^2$ [16]

6. A steel bar of rectangular section 120×240 mm is used as a column with both ends pinned .If the limiting stress is 240N/mm^2 and E=$2 \times 10^5 N/mm^2$,

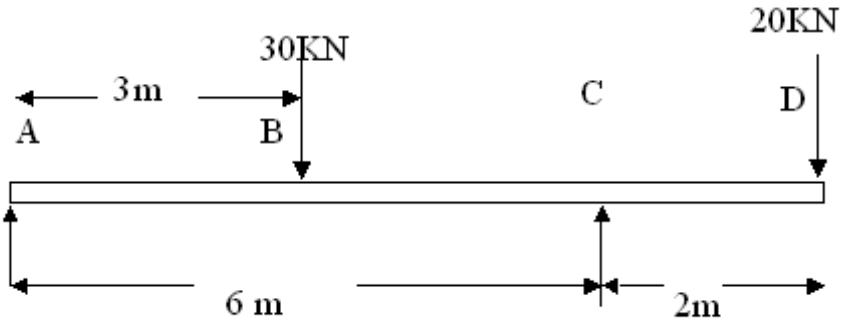

Figure 6:

(a) What is the shortest length of the column for which Euler's theory can apply.

(b) Calculate the safe load if the column is having 4.5m length with factor of safety 2.

(c) What could be the loads taken by the struts if they are of the square and circular shape with the same area of cross-section. [16]

7. For a column with both ends hinged, prove that the critical load P,at the section, distance x by energy method as
P=$\{EI \int^{L} (d^2Y/dX^2)^2 dX\}/\{_0 \int^{L} (dY/dX)^2 dX\}$

EI=flexural rigidity constant
X =deflection at the section
L=length of the column [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]

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

III B.Tech. I Semester Regular Examinations, November -2005
AIRCRAFT STRUCTURES-I
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the moment area method to find slope and deflection of a beam.
   (b) A cantilever beam of span L is point loaded, P at the free end. Find the Slope and deflection using moment area method, assuming uniform flexural rigidity, EI. [16]

2. (a) Explain shear force and bending moment with reference to beams
   (b) Draw the shear force and bending moment diagrams for any four types Beams. [16]

3. A simply supported beam of span L with uniformly distributed load ,w is propped at its midpoint .Find the prop reaction at that point. Draw shear force and Bending moment diagrams. [16]

4. (a) Derive the total strain energy stored in beam subjected to bending.
   (b) Calculate the total strain energy stored in a cantilever beam of span L subjected to concentrated load, P at the free end assuming uniform flexural rigidity EI. [16]

5. Find the maximum deflection and slope at B, using unit load method for the cantilever beam with UDL 20KN/m show in Figure 7
   I=2X$10^8$$mm^4$
   E=2X$10^5$$N/mm^2$ Also determine the maximum BM and draw BMD and shear force diagram.
   [16]

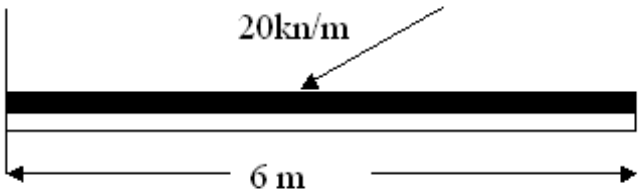

Figure 7:

6. A hollow rectangular column of length 5 m with uniform thickness of 40 mm is fixed at one end and hinged at the other end as shown in (figure8). Find the Euler crippling load . E = 2x10^5 N/mm^2 [16]

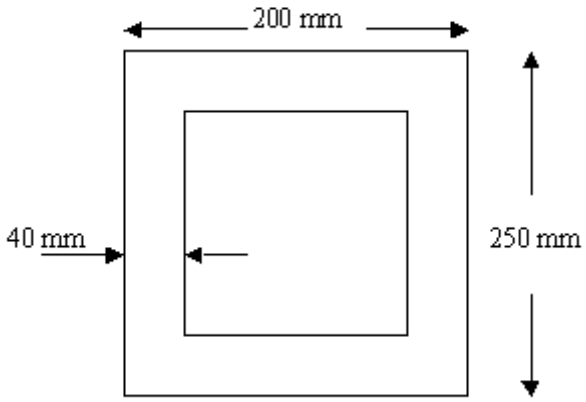

Figure 8:

7. Two long columns having equal length and similar end conditions are of circular cross-section, one solid and the other hollow. Bothe the columns are of the same material and equal weight and the external radius of the hollow column is twice its internal radius. Compare the critical loads for both the columns. [16]

8. A beam-column of span L, which is fixed at one end and hinged supported at the other end is subjected to axial compressive load P, at the ends followed by a transverse load 'Q' at a distance 'a' from the fixed end

   (a) Write the beam column equations considering buckling at section on both sides of Q from hinged suppoort end

   (b) Give the boundary conditions. [16]

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