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

III B.Tech I Semester Regular Examinations, November 2006
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 steel shaft 300 mm diameter , 5m long is used a cantilever. The cantilever carries a point load of 40 KN at its free end. Determine the slope and deflection at a distance 2 m from the free end. E = $2\times10^5 N/mm^2$ [16]

2. (a) Explain Beams of constant strength
   (b) A cantilever beam of span L with point load at free end is of rectangular cross-section. Determine the cross-section and draw the beam of constant strength [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. The structure is supported simply at A and E as shown in (figure4).
   AB =BC=CD=DE=FB=GC=HD= 1m Area of each member is 100mm^2
   E=2×10^5N/mm^2.
   Determine the vertical deflection under the 100KN load using Castiglino's theorem. [16]

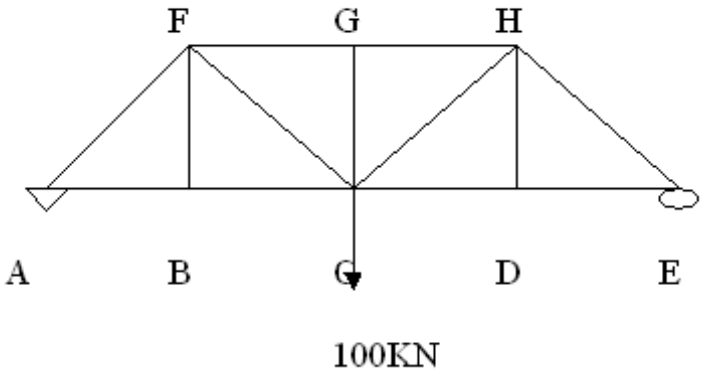

Figure 4

5. Find the horizontal deflection at C using unit load method for the frame shown in figure below5 when horizontal force P is applied at B. EI =constant. [16]

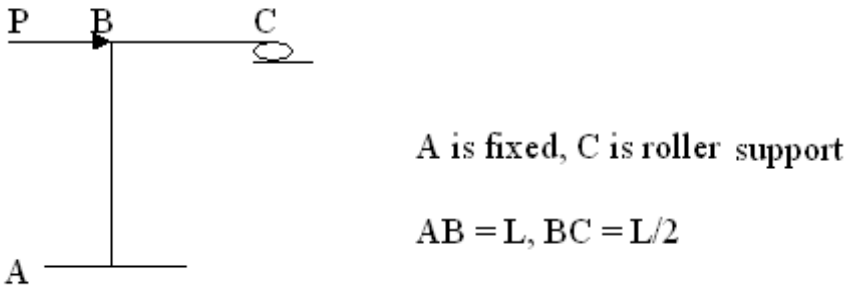

Figure 5

6. A slender column,3m long ,36mm in diameter transmits a longitudinal thrust P acting at the center of the ends. The strut is initially slightly bent the initial central deflection is 5mm.Find the total max. deflection and the max.compressive stress induced in the section ,when P=9KN,E=210GN/ mm^2 [16]

7. A steel rolled joint ISMB300 is to be used as a column of 3m long with both ends fixed. Find safe axial load on the column using Rankine's theory. Factor of safety is 3. Crushing stress is 320N/mm^2K=α=1/7500.Properties of the column section
Area=5626mm^2
I_{xx}=$8.603\times10^7 mm^4$
I_{yy}=$4.539\times10^7 mm^4$ [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 clockwise moment at the middle
   (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 2006
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 simply supported beam of rectangular section having span 6m, is subjected to UDL 'w' over its whole length. The maximum bending stress is 9.6 N/ mm^2. Find the depth of the beam, if the maximum deflection is limited to 1/ 1500 of span. E = 0.15 N/mm^2 [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 fixed beam of span L is subjected to a point load W at the center. Find the end reactions and moments. Draw the shear force and bending moment diagrams. [16]

4. A cantilever beam AB is subjected to uniformly distributed load w per unit length. The length of cantilever is L and its flexural rigidity EI is constant as shown in the (figure4). Determine the deflection at a distance L/2 from the free end using Castiglino's theorem. [16]

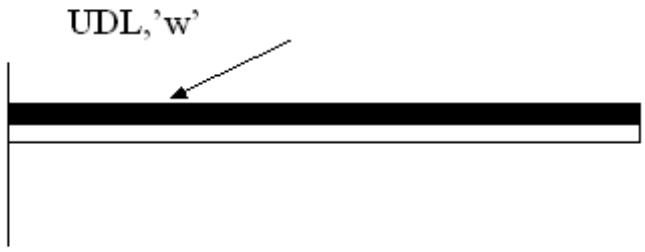

Figure 4

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]

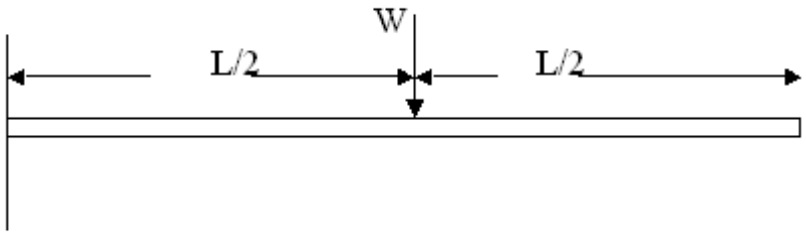

Figure 5

6. Determine the limiting length of a pin-ended column of section 60mm×100mm so that the critical stress is 250 N/mm^{2}Assume
E=$2\times10^5 N/mm^2$ [16]

7. Find the buckling load for a steel column 5 m long, made up of four equal L sections placed each placed back to back as shown in (figure7). Assume both ends are fixed. The critical stress is 32.5 KN/cm^2. k_1= 1/7500 [16]

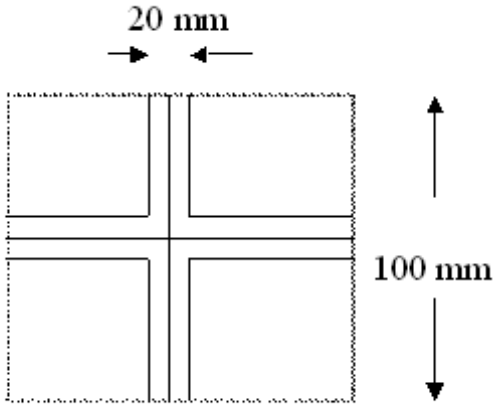

Figure 7

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]

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

III B.Tech I Semester Regular Examinations, November 2006
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. Two cantilevers AB, CD of equal span L are fixed to a wall at A, C in horizontal position paralleling separating by span L. Another beam BD of span L is kept on the cantilevers such that it is resting on the free end of the cantilevers. A load P is applied at the center of BD. Find the net deflection under the load assuming uniform flexural rigidity, EI [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 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 continuous overhang beam is loaded as shown in figure3 with simple supports. . Find the reactions and moments using clapeyron?s theorem of three moments. [16]

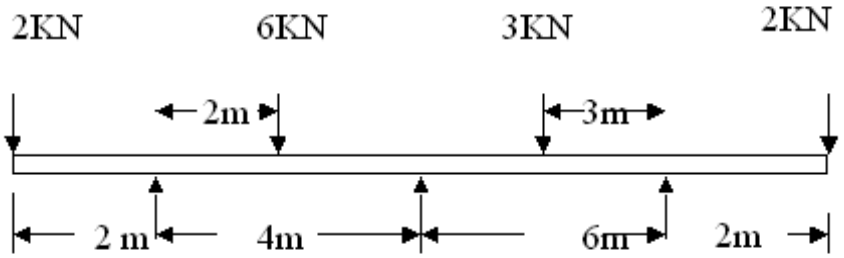

Figure 3

4. A is hinged, B roller support, AB=AC= BD= DE = L= 2 m Find the vertical deflection for the structure as shown in (figure4), under a load of 20KN using Castiglino‘s theorem L=2m,area of each member is 100mm^2 E=2×10^5 N/mm^2 [16]

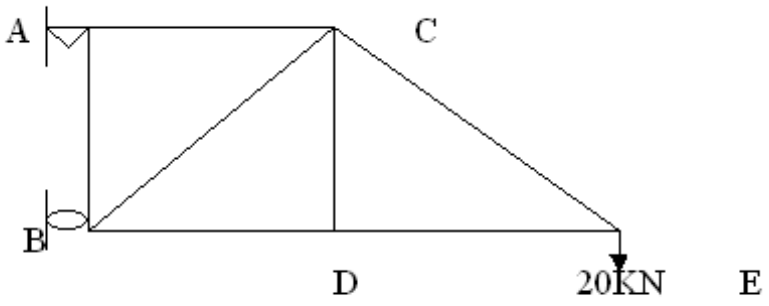

Figure 4

5. A quarter ring of radius R fixed at A and loaded at free end B by point downward load P as shown in figure5. Find the horizontal and vertical deflections at B using unit load method. EI =constant. [16]

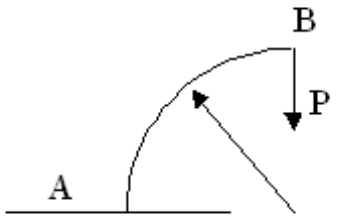

Figure 5

6. Compare the strength of solid circular column of diameter 200mm and hollow - circular column of same cross-sectional area and thickness 30mm.The other parameters are same for both the sections [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) Define beam column
   (b) What are the various loadings for a beam column. [16]

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

III B.Tech I Semester Regular Examinations, November 2006
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 5m is loaded with 50 KN at distance of 3 m from the fixed end and another load 20 KN at the free end. Find the deflection and slope 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 4 KN/m over its entire span and a point load of 50 KN at a distance of 2m from the fixed end. Determine the maximum deflection and slope using superposition method.
   I = $20 \times 10^7 mm^4$ E = 2×10^5 N/mm^2. [16]

3. A propped cantilever of span L is propped at a distance L/4 from the free end and loaded at the free end by a load W. Find the prop reaction and draw the SFD and BMD. [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. AC= CB = 3m Compute the deflection at B and C using unit load method for the cantilever beam shown 5 I=2X$10^8 mm^4$ E=2X$10^5 N/mm^2$

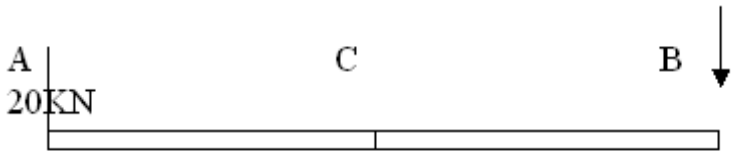

Figure 5

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

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) Define beam column
   (b) What are the various loadings for a beam column. [16]

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