ANNA UNIVERSITY – 2007

B.E/B.TECH MODEL EXAMINATION

AIRCRAFT STRUCTURE-I

(AERONAUTICAL ENGINEERING)

TIME-3HOUR
MARK-100

ANSWER ALL QUESTIONS

PART - A (10 X 2 = 20 MARKS)

1. What is the slope at free end of a cantilever beam of length L and uniform EI when it is subjected to a load P at the free end?

2. A cantilever beam of uniform EI is subjected to moment M at the free end. Sketch the load of the corresponding conjucate beam?

3. Explain the use of Clampeyron's three moment theorem?

4. Explain what is meant by distribution factor?

5. A cantilever beam of length L and uniform EI is subjected to a concentrated load to the free end. Explain how the slope at the free end is obtained using Castigliano's theorem?

6. State and explain Maxwell's reciprocal theorem?

7. Explain what is meant by beam of uniform strength?

8. The cross section of a column is rectangular of width 50 mm and depth 100 mm. What is the value for second moment of area that must be used for buckling load calculation?

9. Define the slenderness ratio for a column of circular section.

10. Define beam column with suitable example.

PART - B (5 X 16 = 80 MARKS)

11. A beam of length L and uniform EI is simply supported at its ends and subjected to a load W at a distance 'a' from left end. Obtain deflection at the mid point and at the point of application of the load using double integration method or area moment method?

12.a) A beam is simply supported at its ends. It is of length L and EI is uniform and subjected to a load D at the mid point of the beam. Using conjucate beam method compute slope at he support and maximum deflection.

OR

12.b) A timber beam 16 cm wide and 20 cm deep is to be reinforced by steel strips each 16 cm wide and 1 cm thick. Find the moment of resistance when (i) the steel strips are attached at the top and bottom so that overall all depth is 22 cm and (ii) the steel strips are attached symmetrically at the sides so that overall width is 18 cm. Allowable stress in the timber is 6 mpa.

13.a)i) Derive the expression for three moment equation.

ii) A simply supported beam ABC is of length 6 m and supported at A, B, and C. AB = 3.6 m and BC = 2.4 m. A load of 2 kN is applied at 1.8 m from A and another load of 4 kN is applied at 1.8 m from C. Assuming EI is constant compute reactions at the support points.

OR

13.b) Obtain the reaction at the support points of the beam shown in fig.1. Using moment distribution method.
14.a)i) Derive the expression for strain energy stored in a beam due to bending.

ii) A beam of length L and uniform EI is simply supported at its ends. It is subjected uniformly distributed load of intensity q N/m. Compute the maximum deflection using Castigliano's theorem.

OR

14.b) A propped cantilever beam AB of length L and uniform EI is subjected uniformly distributed load of intensity q N/m and a concentrated load W at its mid-point. The beam is fixed at A and on roller support at B. Using Castigliano's theorem or any other method compute the reaction forces at the support points A and B.

15.a)i) Derive the expression for Rankine's formula

ii) Compare the buckling loads given by Rankine's and Buller's formulae for a tabular column 2.25m long having outer diameter 37.5mm and inner diameter 32.5mm and both ends are pin ended joints. Assume yield stress to be 315 mpa, Rankine's constant is aced E= 200 Gpa.

OR

15.b)i) Derive the expression for buckling load for a column with one end fixed and the other end free.

ii) Determine the ratio of buckling loads of two columns of circular cross–section one hollow and the etuer solid when both are made of same material, have same length, cross-section area and end conditions. The inner diameter of hollow column is half its outer diameter.