No. of Printed Pages : **4**

BAS-014

00740

B. TECH. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

June, 2013

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours *Maximum Marks : 70*

*Note : (i) Answer **any five** questions.*

*(ii) All questions **carry equal** marks.*

*(iii) Use of non-programmable calculators is **permitted**.*

1. (a) Explain the Flight Envelope with the help of V-N Diagram considering specific reference to positive and negative load factors. **10**

   (b) Explain in short three types of Fuselage Structure. **4**

2. (a) Explain basic features of wing construction. **10**

   (b) Explain the governing equation of deflection of a beam. **4**

3. (a) Explain and define the following in detail by specifying the units wherever applicable. **9**

   (i) Short and long column.

   (ii) Torsionally equivalent shaft

   (iii) End Fixidity of column

(b) List out the assumptions made in Euler's column theory. 5

4. (a) Write down the Rankine's Formula for columns explaining the notations used. Can the Rankine's Formula be used for Long as well as short columns ? Give reasons for your answer. 4

(b) A hollow cast Iron column with fixed ends, supports an axial load of 1000 kN. If the column is 5 m long and has an external diameter of 250 mm, find the thickness of the metal required. 10

Assume Rankine's constant $a = \frac{1}{1600}$ and $F_y = 80$ mPa.

5. (a) What assumptions are made for developing theory of Torsion ? 4

(b) Calculate the maximum Torque that can be safely transmitted by a shaft of 400 mm diameter, if 10

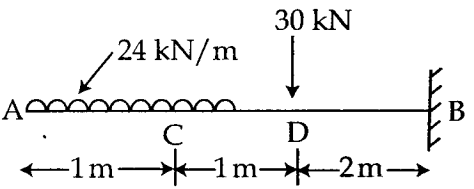
(i) The allowable shear stress is 40 N/mm^2 and

(ii) The maximum allowable angle of twist is 2° in a length of 10 m.

Take $G = 80$ kN/mm^2.

6. Find the slope and deflection at the free end of the cantilever as shown in the figure. **14**

Take $EI = 200 \times 10^6 \text{ N} - \text{m}^2$



7. Answer the following :

(a) Define shear centre and center of twist. **2**

(b) The position of neutral axis depends only upon the cross-sectional geometry. Is the statement True or False ? Explain. **2**

(c) What do you understand by Torsionally equivalent shaft ? **2**

(d) For thin cylinders the ratio **2**

$\frac{\text{diameter}}{\text{thickness}} >$ ..... Fill in the blank

(e) The boundary conditions for a shaft at simple supports are $y = 0 ; \frac{dy}{dx} \neq 0$. **2**

Is the statement True or False ? Explain.

(f) At the middle of a simply supported beam with a single load at the center **2**

$y \neq 0, \frac{dy}{dx} = 0$. Is the statement True or False ?

(g) For thin spherical shell 2

$$\frac{\text{diameter of shell}}{\text{thickness of shell}} > \text{.....}$$ Fill in the blank

8. A beam of I section shown in the figure is simply supported over a span of 10 m. It carries an uniform load of 4 kN/m over the entire span. Evaluate the maximum bending stress. 14