No. of Printed Pages : 4

BAS-014

00381

B.TECH. IN AEROSPACE ENGINEERING (BTAE)

Term-End Examination

June, 2011

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours *Maximum Marks : 70*

Note : *Each question carry **10** marks. Answer **any seven** questions. Use of calculator is allowed.*

1. Explain the following briefly : **5x2=10**

(a) Shear centre

(b) Slenderness ratio

(c) Torsionally equivalent shaft

(d) Limit load factor and ultimate load factor

(e) Polar modulus of a solid and hollow circular shafts.

2. (a) Explain the assumptions made in determining shear stress induced in a circular shaft when subjected to Torsion. **3+7=10**

(b) Derive the expression $\frac{T}{J} = \frac{\tau_{max}}{R} = \frac{G\theta}{L}$ for a circular shaft when subjected to a torque.

3. (a) Explain the salient features of flight envelope with a neat sketch and define corner velocity, positive and negative load factors.

(b) An aircraft with wing loading, W/s, of 70 lb/ft^2 and $C_{Lmax} = 1.5$ has maximum structural load limit of 9. What is its corner velocity at sea level ? **7+3=10**

4. A hollow column has outer diameter 200 mm and thickness of 20 mm. It is 5 m long and its both ends are hinged. **10**

Compute (i) Safe load by Rankine's formula, if factor of safety is 4 (ii) Slenderness ratio (iii) Ratio of Euler's and Rankine critical loads. Given : $\sigma_c = 550\,N/mm^2$, $a = \frac{1}{1600}$,

$E = 9.4 \times 10^4\ N/mm^2$

5. (a) Define thin cylinders. List out the stresses induced in a thin cylinder subjected to internal fluid pressure. **3+7=10**

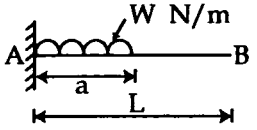
(b) A thin cylindrical drum of 80 cm diameter and 3 m long has a shell thickness of 1 cm. If it is subjected to an internal pressure of 2.5 N/mm^2, find

(i) Change in its length and diameter

(ii) Volumetric strain and change in volume.

6. (a) For the cantilever beam shown, derive an expression for slope and deflection at its free end. **6+4=10**

(b)



If $L = 4$ m

$a = 2.5$ m

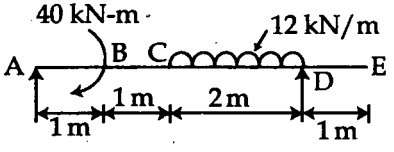
$E = 2 \times 10^5$ N/mm^2

and its cross section is circular of diameter 40 mm, find the slope and deflection at 'B' numerically.

7. (a) Explain the application and working principle of load cells. **4+6=10**

(b) A hollow circular shaft of 20 mm thick is to transmit 300 kW at 200 rpm. Determine the external diameter of the shaft, if the shear strain due to Torsion is not to exceed 0.00086. Take $G = 8 \times 10^4$ N/mm^2.

8. For the over hanging beam shown, find slope and deflection at points C and E. Given that, for the beam, $I = 2000$ cm^4 and $E = 200$ kN/mm^2. **10**



9. A cantilever beam of length 'L' carries a UdL of W/span over its entire span. It is propped at B as shown. **10**

(a) Find the reaction at prop.

(b) Draw SFD and BMD.

(c) The maximum deflection and its location.