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BAS-014

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00073 **December, 2016**

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any **seven** questions. All questions carry equal marks. Use of non-programmable calculator is permitted.*

1. (a) What are the various types of stresses developed in thin cylinders ? *4*

(b) A cylindrical air receiver for a compressor is 2 m in internal diameter and made of plates 15 mm thick. If the hoop stress is not to exceed 90 N/mm^2 and the axial stress is not to exceed 60 N/mm^2, find the maximum safe air pressure. *6*

2. (a) What are the assumptions made in the theory of Pure Torsion ? *3*

(b) A solid circular shaft transmits 75 kW at 200 rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1 degree in 2 metres of shaft and the shearing stress is limited to 50 N/mm^2.

Take $C = 1 \times 10^5$ N/mm^2. *7*

3. A cantilever of length 2 metres carries a uniformly distributed load of 2500 N per metre for a length of 1·25 metres from the fixed end and a point load of 1000 N at the free end. If the section is rectangular, 120 mm side and 240 mm deep, find the deflection at the free end.
Take E = 10000 N/mm^2. *10*

4. Explain, in brief, the following : *10*

(a) Monocoque Fuselage

(b) Semi-monocoque Fuselage

(c) Truss Type Fuselage

(d) Composite Materials

(e) Linearly Varying Distributed Load

5. A shell, 3·5 metres long, 1 metre in diameter, is subjected to an internal pressure of 1 N/mm^2. If the thickness of the shell is 10 mm, find the circumferential and longitudinal stresses. Also find the maximum shear stress and the changes in the dimensions of the shell.
Take E = 2×10^5 N/mm^2 and $\frac{1}{m} = 0{\cdot}3$. *10*

6. A shaft has to transmit 105 kW at 160 rpm. If the shear stress is not to exceed 65 N/mm^2 and the twist in length of 3·5 m must not exceed 1 degree, find a suitable diameter.
Take C = 8×10^4 N/mm^2. *10*

7. Calculate the safe compressive load on a hollow cast iron column (one end rigidly fixed and the other hinged) of 150 mm external diameter and 100 mm internal diameter and 10 metres in length. Use Euler's formula with a factor of safety of 5 and $E = 95\ kN/mm^2$. *10*

8. Explain the following briefly : *5×2=10*

   (a) Modulus of Elasticity

   (b) Modulus of Rigidity

   (c) Hoop Stress

   (d) Shear Force Diagram

   (e) Bending Moment Diagram

9. (a) What is the difference between a column and a beam ? *2*

   (b) Define the effective length of a column. *2*

   (c) Find the shortest length L for a pin ended column having a cross-section of 60 mm × 100 mm for which Euler's formula applies. Take $E = 2 \times 10^5\ N/mm^2$ and critical proportional limit is $250\ N/mm^2$. *6*

10. With the help of V-n diagram explain the flight envelope in reference to positive and negative load factors. *10*