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BAS-014

B. Tech. (AEROSPACE ENGINEERING) (BTAE)

00202

Term-End Examination

December, 2017

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours *Maximum Marks : 70*

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

(ii) *All questions carry equal marks.*

(iii) *Use of Non - programmable calculator is permitted.*

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1. (a) Briefly explain the following : **5**

(i) Strain gauges

(ii) Torque wrenches

(b) Draw a Typical V-n diagram for a jet aircraft. Discuss the salient features of the diagram. **5**

2. Discuss the following. Draw sketches wherever applicable. **10**

(a) Principal Stress

(b) Volumetric Strain

(c) Bulk Modulus

(d) Shear Stress

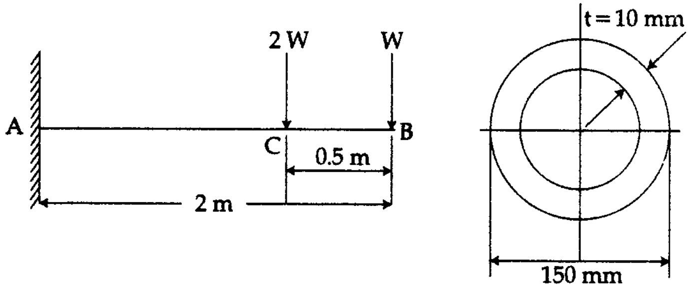
(e) Resilience

3. A 2 metre long cantilever made of steel tube of section 150mm external diameter and 10mm thickness is loaded as shown in the figure. If $E = 200\ GN/m^2$. **10**

Calculate :

(a) The value of W so that maximum bending stress is $150\ MN/m^2$.

(b) The maximum deflection for the loading.



4. A simply supported beam with a span of 4.5 meters carries a point load of 30 kN at 3 meters from the left support. If, for the section, $I_{xx} = 54.97 \times 10^{-6} m^4$ and $E = 200\ GN/m^2$, find : **10**

(a) The deflection under the load.

(b) The position and amount of maximum deflection.

5. An overhanging beam ABC is loaded as shown in the figure. **10**

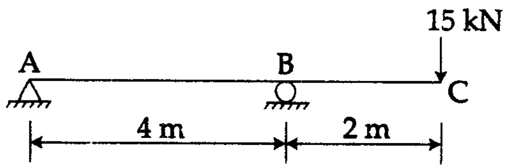
Determine :

(a) Deflection at 'C'.

(b) Maximum deflection between A and B.

Take $E = 200 \times 10^6\ kN/m^2$

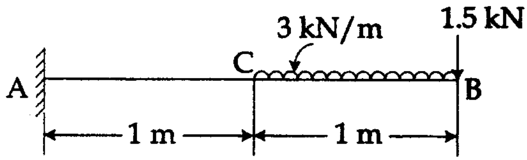
$I = 24 \times 10^{-6} m^4$



6. A 2 meters long cantilever of rectangular section of 150 mm wide and 300 mm deep is loaded as shown in the figure. 10

Calculate the deflection at the free end.

Take $E = 10.5\ GN/m^2$.



7. A solid steel shaft has to transmit 75 kW at 200 rpm. Taking allowable shear stress as $70\ MN/m^2$, find suitable diameter for the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 30%. 10

8. (a) For a thin cylindrical shell, explain the following : 5

   (i) Circumferential or Hoop stress

   (ii) Longitudinal stress

   (b) A thin cylindrical shell of diameter 300mm and wall thickness 6 mm has hemispherical ends. If there is no distortion of the junction under pressure, determine the thickness of hemispherical ends. 5

   Take $E = 208\ GN/m^2$; Poisson's ratio $= 0.3$.

9. (a) Write the assumptions made while deriving the Euler's formula. 4

   (b) A solid round bar 60 mm in diameter and 2.5 m long is used as a strut. One end of the strut is fixed, while the other end is hinged. Find the rate compressive load for the strut using Euler's formula. 6

   Assume $E = 200\ GN/m^2$ and Factor of safety $= 3$.

10. Explain the following terms : **10**

(a) Centroid

(b) Moment of inertia

(c) Bending moment

(d) Thick shells

(e) Torsion