B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

December, 2018

ODD23

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. Explain the following in brief :   *5×2=10*

    (a) Grey Cast Iron

    (b) Alloy Steels

    (c) Bronze

    (d) Brass

    (e) Wrought Iron

2. (a) What do you understand by effective length with respect to columns ? *3*

(b) What are the assumptions made in Euler's Theory ? *4*

(c) Briefly explain the feasible end conditions of a column. *3*

3. The air vessel of a Torpedo is 530 mm external diameter and 10 mm thick, the length being 1830 mm. Find the change in the external diameter and the length, when internal pressure is changed to $10 \cdot 5$ N/mm^2. *10*

Take $E = 2 \cdot 1 \times 10^5$ N/mm^2 and Poisson's ratio = $0 \cdot 3$.

4. Define the following terms : *5×2=10*

(a) Stress

(b) Elastic Limit

(c) Poisson's Ratio

(d) Modulus of Rigidity

(e) Bulk Modulus

5. The figure shows the section of a tube of aluminium alloy. Determine the maximum moment that can be applied to the tube if the permissible bending stress is 125 N/mm². Also find the radius of curvature of the tube as it bends. Take $E = 72800$ N/mm². **10**

t = 5 mm

120 mm

80 mm
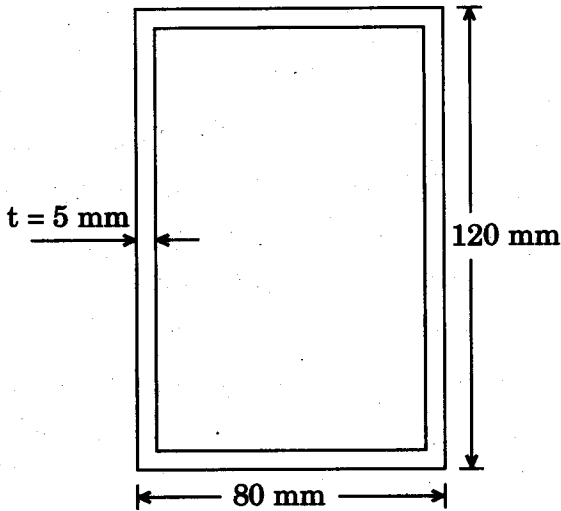
6. (a) Draw a typical V-n diagram for a jet aircraft. Explain the diagram with its salient features. **7**

(b) Explain the following terms : **3**

(i) Inertia Loads

(ii) Thrust Loads

(iii) Pressurisation Loads

7. (a) Find the minimum length of a high strength steel rod of 12·5 mm diameter so that one end can be twisted by 30° with respect to the other end without exceeding a shear stress of 270 N/mm². Modulus of Rigidity $C = 8 \times 10^4$ N/mm².   *6*

(b) What are the assumptions made in the theory of pure torsion ?   *4*

8. A timber beam is simply supported on supports 6 metres apart. It carries a uniformly distributed load of 12 kN/m and a concentrated load of 9 kN at 2·5 m from the left support. If the stress in the timber is not to exceed 8 N/mm², design a suitable section making the depth twice the width.   *10*
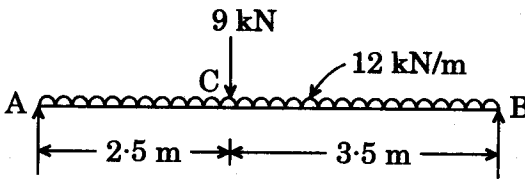
9. A cantilever beam of length L carries a uniformly distributed load of w/span over its entire span. It is propped at B as shown.

(a) Find the reaction at prop.   *3*

(b) Draw Shear Force Diagram and Bending Moment Diagram   *3*

(c) Find maximum deflection and its location.   *4*
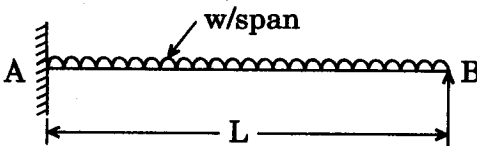
10. A rolled steel joint of 'I' section has the dimensions as shown in the figure below. Flange 250 mm wide and 24 mm thick. Web 12 mm thick, overall depth 600 mm. If the beam carries a uniformly distributed load of 50 kN/m on a span of 8 metres, calculate the maximum stress produced due to bending.

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