

**B. Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

00605

December, 2014

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours

Maximum Marks : 70

*Note : Question no. 1 is **compulsory**. Attempt any **six** questions from the remaining.*

1. Fill in the blanks.

- (a) The critical Euler's load for a long column fixed at the base and hinged at the top is _____ . 1
- (b) The maximum deflection of a simply supported beam subjected to a central point load is _____ . 1
- (c) Lift to weight ratio of an aircraft is termed as _____ . 1

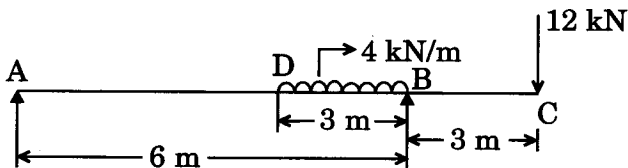
- (d) Longitudinal structural member of a wing is known as _____ . 1
- (e) Moment-area method utilises the properties of the area of the _____ diagram. 1
- (f) The ratio of lateral strain to longitudinal strain is known as _____ . 1
- (g) Unit load method uses the principle of _____ . 1
- (h) A short column is called a _____ . 1
- (i) _____ is that point in the cross-section through which shear loads produce no twist. 1
- (j) $\frac{dM}{dx} =$ _____ . 1

2. The equation for the deflected shape of a beam carrying a udl and simply supported at its ends is given by $y = \frac{1}{EI} \left(2x^3 - \frac{x^4}{6} - 36x \right)$. Determine

the load carried by the beam and draw the SFD and BMD for the beam. EI is in kNm^2 . 10

3. A beam ABC of length 9 m has one support at the left end and the other support at a distance of 6 m from the left end. The beam carries a point load of 12 kN at the right end and also carries a UDL of 4 kN/m over a length of 3 m as shown in figure. Determine the slope and deflection at point C. $E = 2 \times 10^5 \text{ N/mm}^2$, $I = 5 \times 10^8 \text{ mm}^4$.

10



4. Find the slope and deflection of a simply supported beam carrying a point load at centre by Mohr's Method.
5. Explain briefly the salient features of the V-n diagram with a neat sketch.
6. A hollow circular shaft 20 mm thick transmits 300 kW power at 200 rpm. Determine the external diameter of the shaft if the shear strain due to torsion is not to exceed 0.00086. $G = 0.8 \times 10^5 \text{ N/mm}^2$.

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7. 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 5+5=10
- (a) the change in its length and diameter.
- (b) the volumetric strain and change in volume.
- $E = 2 \times 10^5 \text{ N/mm}^2$, Poisson's ratio = 0.25.
8. Derive an expression for the crippling load for a long column when both the ends of the column are fixed. 10
9. (a) Find Euler's critical load for a hollow cylindrical cast iron column 200 mm external diameter and 22 mm thick, if it is 6 m long and hinged at both ends. $E = 8 \times 10^4 \text{ N/mm}^2$. 3
- (b) Compare Euler's critical load with the Rankine critical load taking $f_c = 550 \text{ N/mm}^2$ and $\alpha = \frac{1}{1,600}$. 3
- (c) For what length of the column would the critical loads by Euler's and Rankine's formula be equal? 4
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