No. of Printed Pages : 3 **BAS-014**

00171

B. TECH. (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2013

BAS-014 : AIRCRAFT STRUCTURES

Time : 3 hours *Maximum Marks : 70*

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

*(ii) All questions **carry equal** marks.*

*(iii) Use of non-programmable calculators is **permitted**.*

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1. Explain the following briefly : **14**

(a) Shear centre

(b) Principle of superposition

(c) Endurance Limit

(d) Poisson ratio

(e) Slenderness ratio

(f) Young's modulus

(g) Factor of Safety

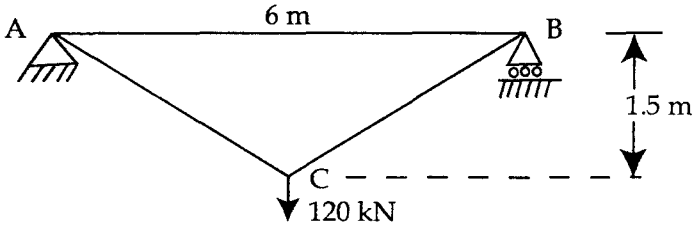
2. (a) Derive the expression $\frac{T}{J} = \frac{\tau_{max}}{R} = \frac{G\theta}{L}$ for a circular shaft when subjected to a Torque. **10**

(b) Find the maximum Torque that can be safely transmitted by a shaft of 400 mm diameter, if the shear stress is not to exceed 50 N/mm^2. **4**

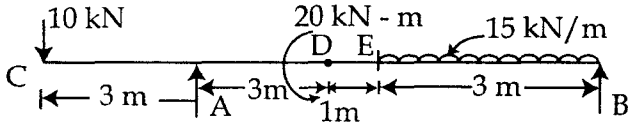
3. (a) Explain the Flight Envelope with the help of V-N diagram considering specific reference to Positive and Negative Load Factors. **10**

(b) Explain the term, corner velocity and its significance. **4**

4. Find the deflection at 'C' using strain energy principle . Take $E = 2 \times 10^5$ N/mm^2 and cross - sectional area of members AC and BC as 800 mm^2 each and that of AB as 1000 mm^2. **14**



5. For a beam shown below **14**



Find

(a) Slope at C, A and E

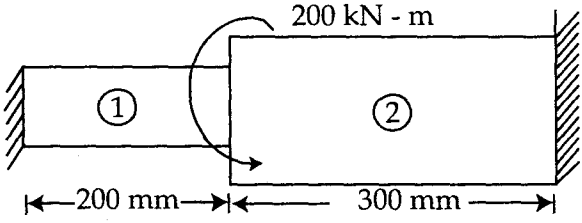
(b) Deflections at C, D and E

Given :

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

$I = 2 \times 10^9$ mm^4

6. For a composite shaft shown below **14**



Find

(a) Resisting Torques at fixed ends.

(b) Twist in each section.

Given :

Section A : Steel $G = 8 \times 10^4$ N/mm^2 diameter 40 mm

Section B : Aluminum $G = 4 \times 10^4$ N/mm^2 diameter 60 mm.

7. A solid shaft of diameter 'D' and length 'L' is to be replaced by a hollow shaft of outer diameter 'D' and of inner diameter 'd' and of length equal to that of the solid shaft. If $G_{hollow} = 1\text{-}5\ G_{solid}$, estimate percentage saving in material. Repeat the calculations if $G_{hollow} = G_{solid}$. **14**

8. A spherical vessel with 6m diameter, contains a corrosive gas at a pressure of 1.4 MN/m^2. The vessel can withstand a maximum stress of 85 MN/m^2. Due to corrosion the metal of wall is eroded at a rate of 0.3 mm per year. If the initial thickness of wall is 25 mm, find the life of the vessel. **14**