



# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)



## DEPARTMENT OF AEROSPACE ENGINEERING

Subject Code & Name: 19AST203 Aircraft Structural Mechanics

TOPIC: Shear force and bending moment distribution over the aircraft fuselage

Idealization (fuselage)

$$(\text{Area of Boom})_i \Rightarrow B_i = C \cdot s \cdot \text{area} + \frac{tD}{6} \left(2 + \frac{s_2}{s_1}\right) + \frac{tD}{6} \left(2 + \frac{s_1}{s_2}\right)$$

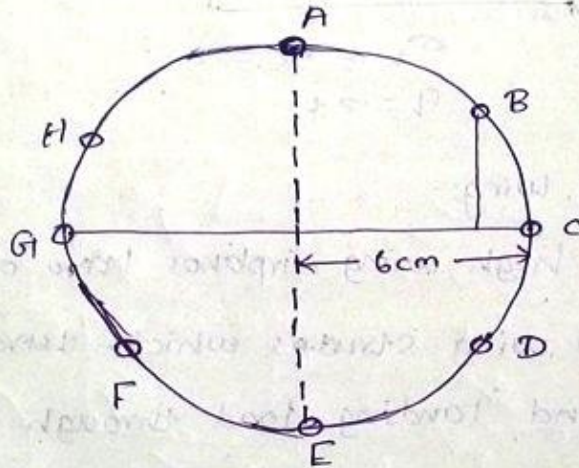
05-10-24  
2) A fuselage of light passenger carrying aircraft has circular cross section as shown. The cross sectional area of each stringer is  $100 \text{ mm}^2$ . If the fuselage subjected to  $200 \text{ kN-m}$  bending moment applied in vertical plane of symmetric. calculate direct stress distribution.

By Symmetry,

$$B_1 = B_9$$
$$B_5 = B_{13}$$

29-09-21

1) Following figure indicates idealized having no of stringers which are placed equal placing placed around with circumference of fuselage. each stringer has cross sectional area 120 section radius 60 cm. wall thickness 1.5 mm. Section is subject to bending moment in vertical plane of symmetry 200 kNm and bending moment in horizontal 40 kNm of m. calculate direct stress in stringers.



Soln:-

$$\sigma = \frac{M_x}{I_{xx}} y + \frac{M_y}{I_{yy}} x$$

$$I_{xx} = \sum I_{cx} + \sum Ay^2 - \sum Ay^2$$

$$= [1200 \times (300)^2 + 120 (600)^2 + 120 (300)^2] \times 2$$

$$= 129.6 \times 10^4 \text{ mm}^4$$

$$I_{yy} = \sum I_{cy} + \sum Ax^2 - \sum Ax^2$$

$$= [120 \times (300)^2 + 120 (600)^2 + 120 (300)^2] \times 2$$

$$= 129.6 \times 10^6 \text{ mm}^4$$

$$M_x = 200 \times 10^3 \times 10^3 \text{ N}\cdot\text{mm}$$

$$M_y = 40 \times 10^3 \times 10^3 \text{ N}\cdot\text{mm}$$

$$\sigma = \frac{200 \times 10^6}{129.6 \times 10^6} y + \frac{40 \times 10^6}{129.6 \times 10^6} x$$

$$\sigma = 1.543 y + 0.308 x$$

Boom	x	y mm	$\sigma$
A	0	600	
B	300	300	
C	600	0	
D	300	-300	
E	0	-600	
F	-300	-300	
G	-600	0	
H	-300	300	

