Subject Code & Name: 19AST203 Aircraft Structural Mechanics

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

Idealization (fusolage)

(Area of Boom), $\Rightarrow B_1 = C \cdot s \ area + \frac{tD}{6}\left(2 + \frac{\sigma_2}{\sigma_1}\right) + \frac{tD}{6}\left(2 + \frac{\sigma_{12}}{\sigma_1}\right)$

01-10-14

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


By Symmetry,

$B_1' = B_9$

$B_5 = B_{13}$

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 1.2mm. Section is subject to bonding moment in vertical plane of symmetry 200 kNm and bending moment in horizontal 40 kN of m. calculate direct stress in stringers.
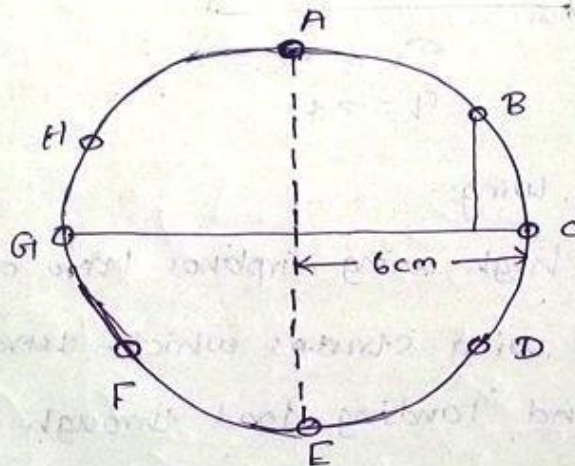
Soln:-

$$\sigma = \frac{\overline{M}x}{Ixx} y + \frac{\overline{M}y}{Iyy} x$$

$$Ixx = \Sigma Icx + \Sigma Ay^2 - \Sigma Ay^2$$

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

$$= 129 \cdot 6 \times 10^4 \, mm^4$$

$$Iyy = \Sigma Icy + \Sigma Ax^2 - \Sigma Ax^2$$

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

$$= 129 \cdot 6 \times 10^6 \, mm^4$$

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

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

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

$$\boxed{\sigma = 1.543 \, y + 0.308 \, x}$$

Boom	x	y mm	σ
A	0	600	
B	300	300	
C	600	0	
D	800	-300	
E	0.	-600	
F	-300	-300	
G	-600	0	
H	-300	300	