



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

DEPARTMENT OF AEROSPACE ENGINEERING



Subject Code & Name: 19AST203 Aircraft Structural Mechanics

TOPIC: Shear flow in single and multicell under bending with walls effective

2) Find shear flow and twist per unit length of cell structure is shown in fig. The material used is Aluminium, $E = 70 \text{ GPa}$
 $T = 75 \text{ kN-cm}$, poisson's ratio, $\mu =$

Soln:-

Area of cell ①. $A_1 = 25 \times 25 = 625$

Cell ②. $A_2 = 625$

$$a_1 = \frac{S_1}{t_1} = \frac{25}{0.1} + \frac{25}{0.1} + \frac{25}{0.2} = 625$$
$$a_{12} = \frac{S_{12}}{t_{12}} = \frac{25}{0.1} = 250$$

$$a_2 = \frac{s_2}{t_2} = \frac{25}{0.15} + \frac{25}{0.1} + \frac{25}{0.1} = 666.66$$

$$\theta = \frac{1}{2Aa} \int q \frac{ds}{dt}$$

for cell ①,

$$2A\theta_1 = \frac{1}{A_1} [q_1 a_1 + (q_1 - q_2) a_{12}]$$

$$2A\theta_1 = \frac{1}{625} [625q_1 + 666.66q_1 - 666.66q_2]$$

$$2A\theta_1 = \frac{1}{625} [1291.66q_1 - 666.66q_2]$$

$$2A\theta_1 = 2.06q_1 - 1.06q_2 \quad \text{--- ①}$$

$$2A\theta_2 = \frac{1}{A_2} [q_2 a_2 + (q_2 - q_1) a_{12}]$$

$$2A\theta_2 = \frac{1}{625} [$$

$$2A\theta_1 = \frac{1}{625} [625q_1 + 250q_1 - 250q_2]$$

$$2A\theta_1 = \frac{1}{625} [875q_1 - 250q_2]$$

$$2A\theta_1 = 1.4q_1 - 0.4q_2 \quad \text{--- ①}$$

$$2A\theta_2 = \frac{1}{A_2} [q_2 a_2 + (q_2 - q_1) a_{12}]$$

$$2A\theta_2 = \frac{1}{625} [666.66q_2 + 250q_2 - 250q_1]$$

$$2Q\theta_2 = \frac{1}{625} [916.66 q_2 - 250 q_1] \quad \frac{1}{25} = 10$$

$$2Q\theta_2 = 1.4 q_2 - 0.4 q_1 \quad \frac{1}{25} \left[\frac{1}{1000} \right] \quad \textcircled{2}$$

$$[1000 q_1 - 1000 q_2] \frac{1}{14} = 1000$$

$$[1000 q_1 - 1000 q_2 + 1000 q_2] \frac{1}{25} = 1000$$

$$[1000 q_1 - 1000 q_2] \frac{1}{25} = 1000$$

$$\textcircled{1} \rightarrow 1000 q_1 - 1000 q_2 = 1000$$

$$[1000 q_1 - 0 q_2 + 2000 q_2] \frac{1}{25} = 1000$$

$$[1000 q_1 + 2000 q_2] \frac{1}{25} = 1000$$

$$[1000 q_1 + 1000 q_2 + 1000 q_2] \frac{1}{25} = 1000$$

$$[1000 q_1 + 1000 q_2] \frac{1}{25} = 1000$$

$$\textcircled{2} \rightarrow 1000 q_1 + 1000 q_2 = 1000$$

$$[1000 q_1 - 0 q_2 + 2000 q_2] \frac{1}{25} = 1000$$

