

Continues EC-17

MTC-2/Sem-2/Unit-2 (EC-18) Phy/VKs.

$$a [2 \sin n\delta \cdot \cos(n-1)\delta]$$

Thus,  $2A \cos\phi \sin n\delta = a [2 \sin n\delta \cdot \cos(n-1)\delta]$

$$\therefore A \cos\phi = \frac{[a \sin n\delta \cdot \cos(n-1)\delta]}{\sin n\delta} \quad \text{--- (3)}$$

Multiplying equation (1) by  $2 \sin\delta$  and proceeding in a similar way it can show that

$$A \sin\phi = \frac{[a \sin n\delta \sin(n-1)\delta]}{\sin n\delta} \quad \text{--- (4)}$$

Squaring equations (3) & (4) & adding,

$$\begin{aligned} A^2 &= A^2 (\sin^2\phi + \cos^2\phi) \\ &= \frac{a^2 \sin^2 n\delta}{\sin^2 n\delta} [\sin^2(n-1)\delta + \cos^2(n-1)\delta] \\ &= \frac{a^2 \sin^2 n\delta}{\sin^2 n\delta} \end{aligned}$$

$$\therefore A = a \sin n\delta / \sin n\delta$$

Dividing eq. (4) by (3) we get

$$\begin{aligned} \tan\phi &= \frac{A \sin\phi}{A \cos\phi} \\ &= \frac{a \sin n\delta \cdot \sin(n-1)\delta \cdot \sin\delta}{\sin n\delta \cdot a \sin n\delta \cdot \cos(n-1)\delta} \\ &= \tan(n-1)\delta \end{aligned}$$

$$\therefore \phi = (n-1)\delta$$

where  $\phi$  represents the epoch angle for the resultant vibration,  $n$  is the no. of SHM's vibrations  
coetime.