Explain the principle of operation of phase comparison monopulse tracking radar with a block diagram.

Ans: Oct./Nov.-17, Set-1, Q5(a)

The phase comparison monopulse tracking radar technique is widely used by the radio astronomers.

The angle of arrival is measured by comparing the phase relationships in the signals from the separated antennas.

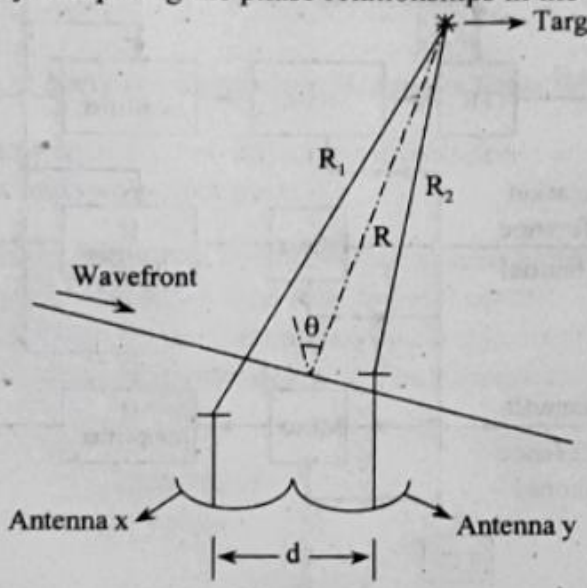

Figure: Waveform Phase Relationships in Phase Comparison Monopulse Radar

Figure shows, two antennas separated by a distance 'd' and the target is at a distance of 'R' from the antenna. The distance of target from the antenna '1' is given by,

$$R_1 = R + \frac{d}{2}\sin\theta$$

And the distance of target from the antenna '2' can be given as,

$$R_2 = R - \frac{d}{2}\sin\theta$$

The phase difference between the two echo signals is approximately given as,

$$\Delta\phi = \frac{2\pi}{\lambda} d \sin\theta.$$

For the small values of θ, where $\sin\theta \cong \theta$, the phase difference is a linear function of the angular error.

By using the phase comparison principle, the phase difference between the signals in two fixed antennas is measured with the help of servo controlled phase shifter. It is applicable in missile guidance.