Section D

- Radars

Factors affecting range of radar

$$\mathrm{A_e} = \frac{G\lambda^2}{4\pi}$$

$$R_{\max} = \left[\frac{\mathrm{P_t} A_e{}^2 \sigma}{4\pi\lambda^2 S_{\min}} \right]^{\frac{1}{4}}$$

$$R_{\max} = \left[\frac{\mathrm{P_t} G^2 \lambda^2 \sigma}{(4\pi)^3 S_{\min}} \right]^{\frac{1}{4}}$$

- Transmitted power
- Frequency
- Target cross section area:-ratio of power reflected back by the target towards the source per unit solid angle to the incident power density on the target

Minimum received signal power

- Minimum detectable signal at the receiver

$$F = \frac{\frac{S_i}{N_i}}{\frac{S_o}{N_o}}$$

$$F = \frac{S_i}{S_o} * \frac{S_o}{N_i}$$

$$F = \frac{S_i}{GS_i} \times \frac{\Delta N + GNi}{N_i}$$

$$F = 1 + \frac{\Delta N}{GN_i}$$

$$\Delta N = (F - 1)GN_i$$

$$N_i = kT_oB$$

$$\Delta N = (F - 1)GkT_oB$$

$$R_{\max} = \left[\frac{P_t . A_e^2 \sigma}{(4\pi\lambda^2)^2 (F - 1)GkT_oB} \right]^{\frac{1}{4}}$$

$$A_e = \frac{0.65\pi D^2}{4}$$

Maximum Unambiguous range

- T=Tr=Ton +Toff= 1/prf
- Rmax=$\frac{cT}{2}$

= second time Around echoes

The range beyond which target appears as second –time around ‘Maximum unambiguous Range

Runamb

Pulsed Radar system

- Triggered source
- Pulse modulator
- Output tube
- Duplexer

Receiver

1. Low noise amplifier
2. Mixer
3. Local oscillator
4. IF amp
5. Detector
6. Radar display

- Deflection modulation CRT screen A-scope
- Intensity modulation of CRT (Plan position indictor)
- Feeding the data to a computer