MODEL TEST PAPER

SUB CODE : 206

EL-II year

Attempt any 3 questions

Q:1 what is amplitude modulation. Calculate its total power? 1+4

Ans: It is the process in which peak amplitude of the carrier signal will be varied linearly w.r.t msg signal amplitude variations.

expression $S_{AM}(t) = A_c [1 + K_a m(t)] \cos \omega_c t$

$m(t)$ - msg signal

K_a - Amplitude Sensitivity

$$S_{AM}(t) = A_c \cos \omega_c t + \frac{\mu A_c}{2} \cos(\omega_c + \omega_m)t + \frac{\mu A_c}{2} \cos(\omega_c - \omega_m)t$$

$$P_c = \left(\frac{A_c}{\sqrt{2}}\right)^2 \frac{1}{R} = \frac{A_c^2}{2R}$$

$$P_{USB} = \left(\frac{\mu A_c}{2}\right)^2 / 2R = \frac{\mu^2 A_c^2}{8R}$$

$$P_{LSB} = \left(\frac{\mu A_c}{2}\right)^2 / 2R = \frac{\mu^2 A_c^2}{8R}$$

P_{USB} = power of upper sideband

P_{LSB} = power of lower sideband

P_c → Carrier power

μ → Modulation index

$$P_t = P_c + P_{USB} + P_{LSB}$$

$$= \frac{A_c^2}{2R} + \frac{\mu^2 A_c^2}{8R} + \frac{\mu^2 A_c^2}{8R}$$

$$P_t = \frac{A_c^2}{2R}\left(1 + \frac{\mu^2}{2}\right)$$

$$\boxed{P_t = P_c\left(1 + \frac{\mu^2}{2}\right)}$$

Q:2 In Space wave propogation if transmitter antenna height is 100 mtr and Receiver antenna height is 25 mtr. then Calculate max. Communication distance ? — (5)

Ans: $h_t = 100$ mtr

$h_r = 25$ mtr

$$d = 4.12\left[\sqrt{h_t} + \sqrt{h_r}\right]$$

$$d = 4.12\left[\sqrt{100} + \sqrt{25}\right]$$

$$= 4.12[10 + 5]$$

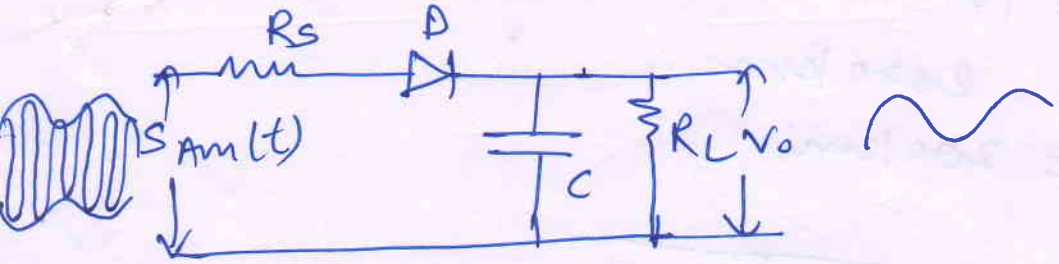
$$= 4.12[15]$$

$d =$ km

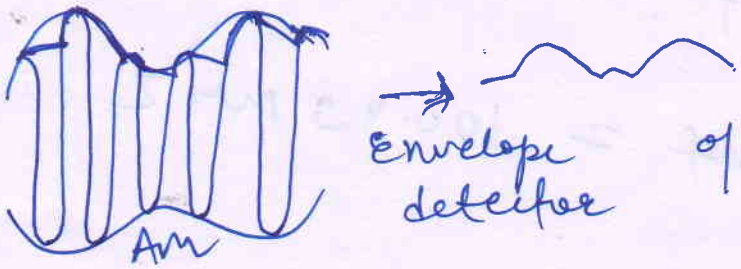
Q:3 What is demodulation & how demodulation in AM is done ? — (5)

Ans: Demodulation is a process in which carrier wave and message signal are separated from each other or original signal is extracted from modulated signal.

in AM diode detector is used for demodulation



it is also called envelope detector. It is very simple & cheap. it extracts the positive envelope of modulated signal and gives o/p in this circuit capacitor is charged upto peak value of modulated wave and than discharge but due to $R_L C <$ radio frequency time constant capacitor volt discharges very small and it again charged..



for $\mu \leq 1$ envelope of AM signal will be m(t) So it can be demodulated by envelope detector. for $\mu > 1$ message signal it can not be recovered by this method

Q:4 A high frequency link is established between two points spaced at a distance of 2000 km. Ionosphere reflection field is at a height of 200 km. Critical freqn is 10 MHz Calculate MUF for the path? (5)

Ans:- $f_c = 10\ MHz$

$D = 2000\ km$

$h = 200\ km$

$$\therefore f_{muf} = f_c \sqrt{1+\left(\frac{D}{2h}\right)^2}$$

$$f_{muf} = 10\sqrt{1+\left(\frac{2000}{2\times 200}\right)^2}$$

$$= 10\left[1+\frac{400}{4}\right]^{1/2}$$

$$f_{muf} = 10\sqrt{101}$$

$$f_{muf} = 100.49\ MHz$$

मीनाक्षी विमल