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Subject # Communication System.

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Date # 29/9/2020.

Question #1

Answer:-

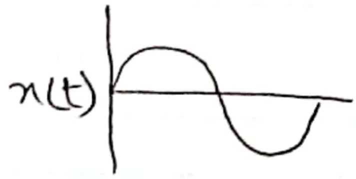
Data $f_m = 250\,Hz$. f_s

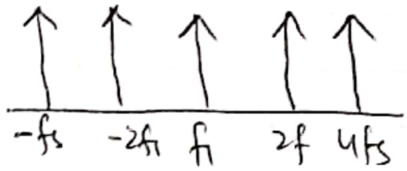
(a) Nyquist Rate

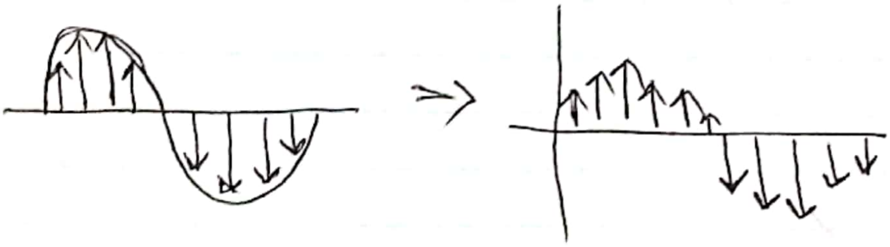
$NR > 2f_m$

$2 \times 250 = 500\,Hz$

(b)







(c) Cut off frequency.

$$f_c = \frac{1}{2\pi CR} \Rightarrow \frac{1}{2 \times 3.14 \times 500} = 0.0031$$

(d) $f_s = 800\,Hz$

Question # 2.

Part (a).

Answer:- Let $x(t)$ be a signal with Nyquiste rate - - - -

(i) $x(t) + x(t-1)$

Solution:-

$x(t) \rightarrow NR = fs$

$x(t)$ (fs) $\xrightarrow{T.S} x(t-1)$ (fs)

$m(t) = x(t) + x(t-1) \rightarrow NR = ?$

$\downarrow$ NR = ws, $\downarrow$ fs, $\downarrow$ fs

Answer :-

(ii) $dx(t)/dt$

Solution:- $m(t) = \frac{d\,x(t)}{dt}$ (ws) $\rightarrow$ ws

Ans :-

Question # 2.
Part (b).

Answer:- Sol:-

$m(t) = 10 \sin 400\pi t$

$\omega_m = 400\pi \ \frac{rad}{sec}$

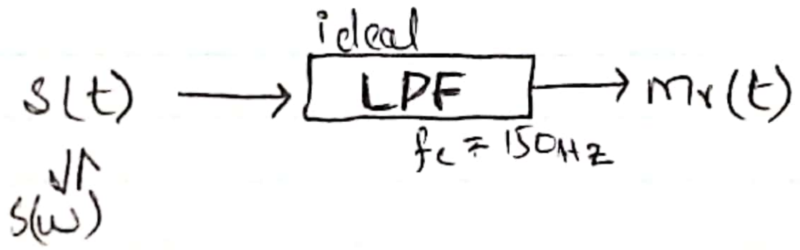
$f_m = \frac{\omega_m}{2\pi}$

$= 400\pi / 2\pi$

$f_m = 200 \ Hz$

$\omega_s = 300 \ Hz$

$f_s = 300 \ Hz$



$\boxed{nf_s + f_m}$, freq comp = ?

$n = 0 \Rightarrow f_m = 200 Hz$

$n = 1 \Rightarrow f_s + f_m = 500 \ Hz , 100 \ Hz$

$n = -1 \Rightarrow -f_s + f_m = -100 Hz , -500 Hz$

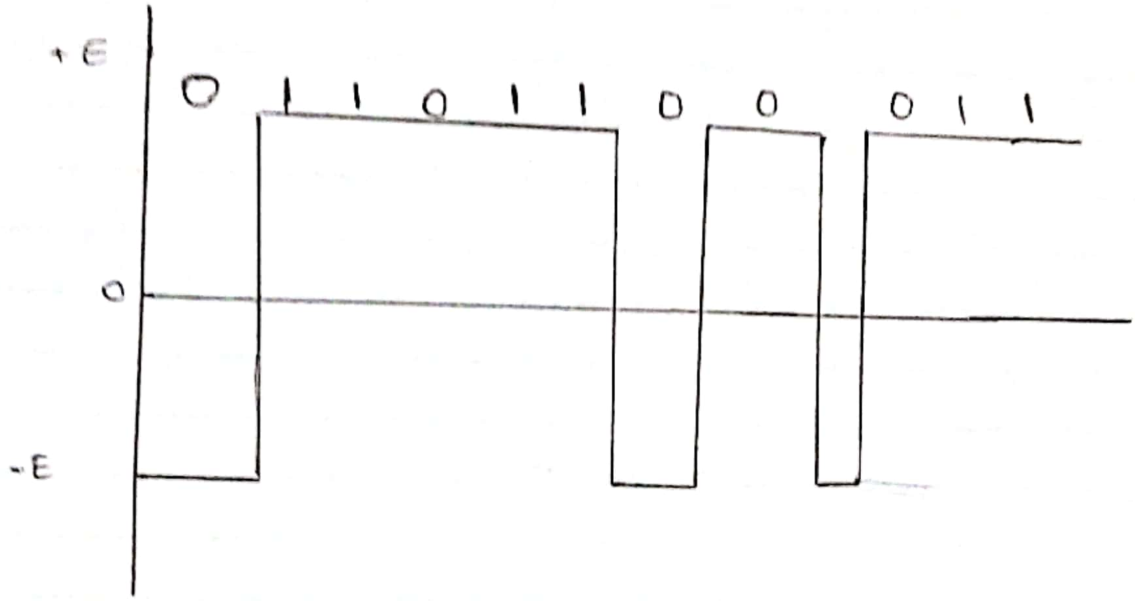
$\boxed{f_c = 150 \ Hz.}$

Question # 3.

Answer:-

(a) ⇒ (01101100011).

NRZ-S

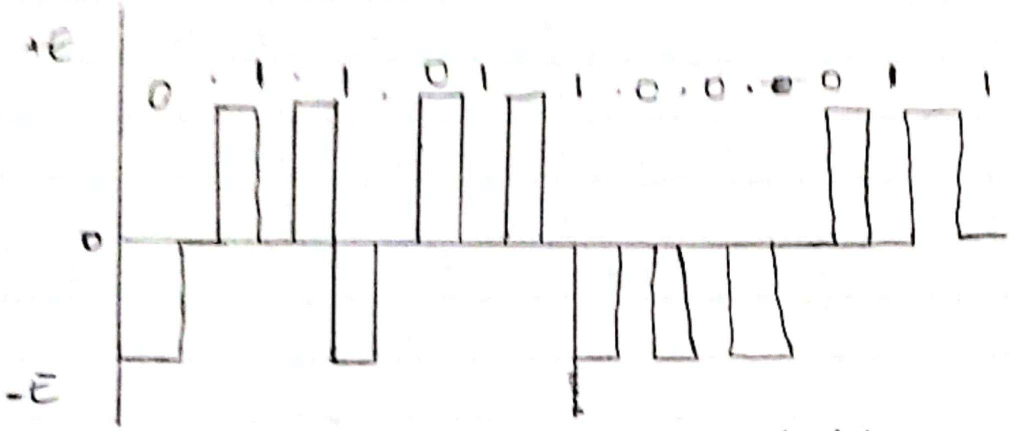


NRZ Space (NRZ-S) Differential coding.

"One" is represented by a no change in level.

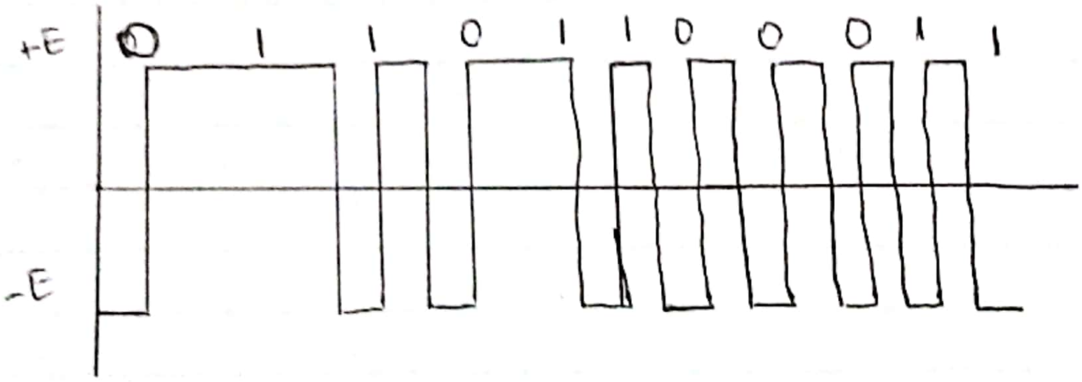
"Zero" is represented by a change in level.

(b) Polar- RZ



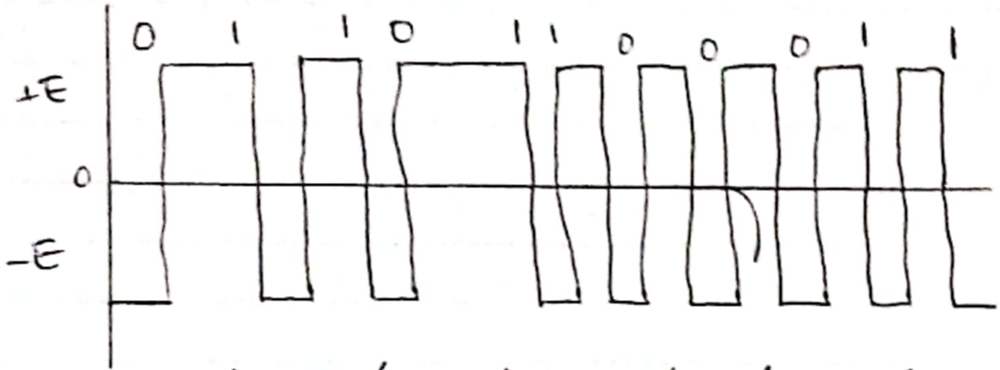
"one" & "zero" are represented by opposite level polar pulses that are one half-bit in width.

(c) Split phase manchester :-



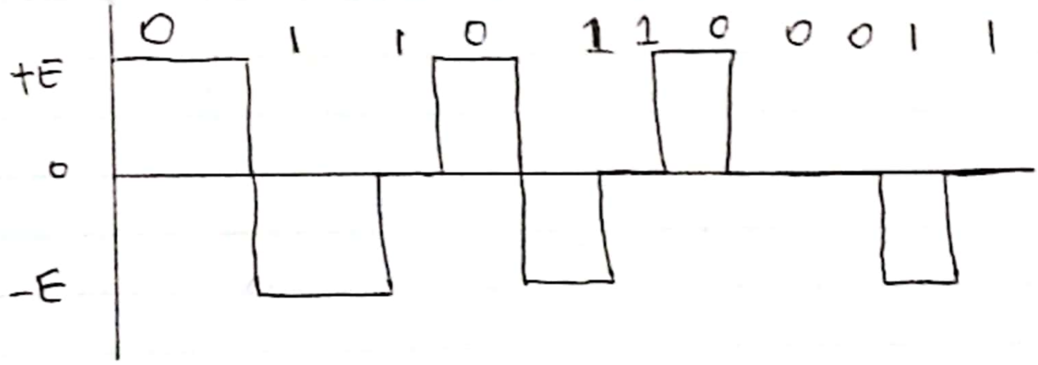
"one" is represented by a 10
"Zero" is represented by 01

(d) Bi – ϕ – L PCM waveform.



Bi-ϕ-L (Biphase level or split phase menchester) 11+180°)
"one" is represented by a 10
"zero" is represented by a 01.

(e) Dicode - NRZ PCM waveform.



Dicode Non- Return to zero

A "one" to "zero" or "zero" to "one" change polarity.
otherwise a zero is sent.

Question #4.
Answer:-

Part (a):

Solution:- $m=0.5$, $e_c = 7.5$ $E_c = 7.5$ volts

let us consider Em form Ec sine.

$$m = \frac{E_m}{E_c}$$

Therefore, $E_m = m \times E_c$

$= 0.5 \times 7.5$

$= 3.75$ volts

$E_{max} = E_c + E_m$

$= 7.5 + 3.75$

$= 11.2500$ Hz

$E_{min} = E_c - 4m$

$= 7.5 - 3.75 \Rightarrow 3.75$ volts.

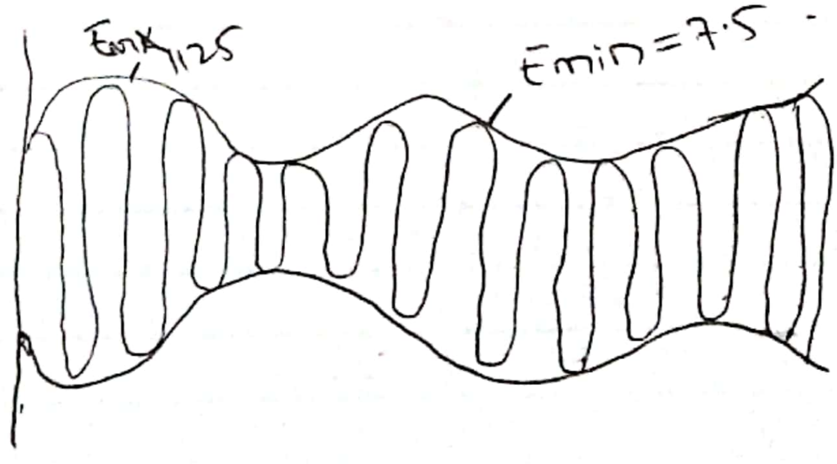
modulated wave form

So, As we know that

$m = 0.5$

$E_{mx} = 11.25$

$E_{min} = 3.75$



Question #4
Part (b).

(a) Dept of modulation.

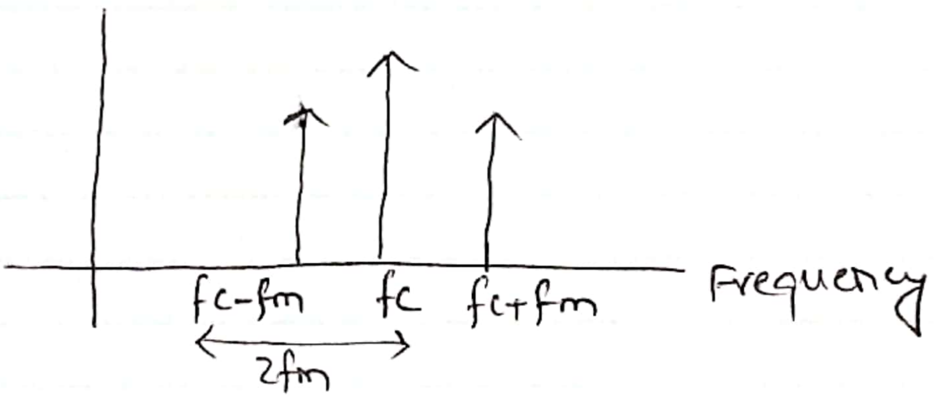
$m = E_m/E_c \Rightarrow 10V/5V \Rightarrow 2V$.

Transmission efficiency

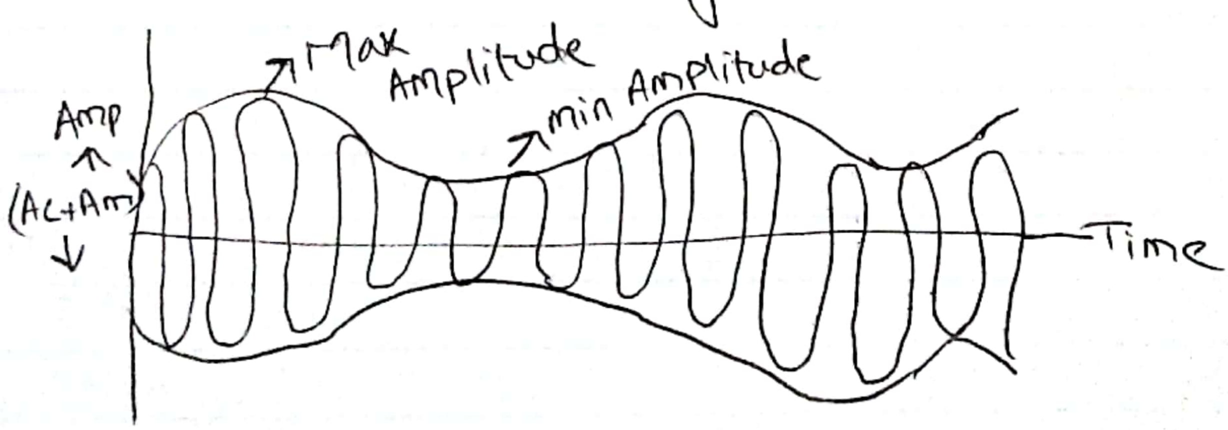
$tf = m^2/2+m^2$

$$tf = \frac{(2)^2}{2+(2)^2} \Rightarrow 2/3$$

(b)



Amplitude frequency.



(c) Power in spectrums:-

$$P_c = \frac{E_c^2}{2 \times R} = \frac{(5)^2}{2 \times 50} = \frac{25}{100} = 1/4$$

and total power $= P_t \left(1 + \frac{m^2}{2}\right) P_c$

$$P_t = \left[1 + \frac{(2)^2}{2}\right) \times 0.2$$

$$P_t = \left[1 + {}^{2}\cancel{4}/\cancel{2}\right] \times 0.2$$

$$P_t = 3 \times 0.2 = 0.6$$

(d) Percentage Power in USB.

$$P_{USB} = \frac{m^2 E_c^2}{8} = \frac{m^2 P_c}{4}$$

$$= \frac{(2)^2}{4} \times 0.6$$

$$= \frac{\cancel{4}}{\cancel{4}} \times 0.6$$