



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) What is the purpose of Fourier series ? Evaluate the trigonometric Fourier series expansion of a full wave rectified cosine function shown in fig. Q. 1 (a) 7

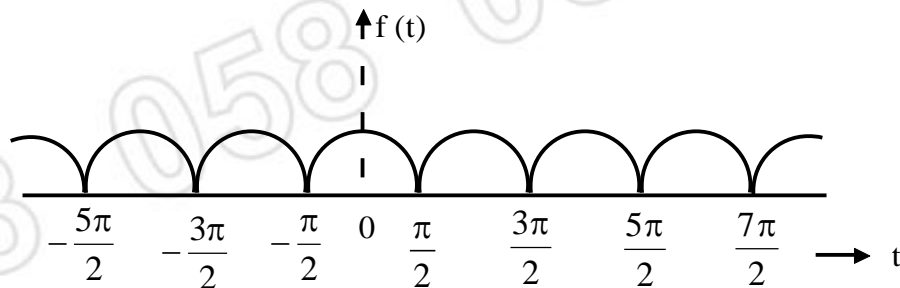


Fig. Q.1(a)

- b) What is the condition of existence of Fourier transform ? Find the Fourier transform of RF pulse shown in fig. Q. 1(b) if it exists. 7

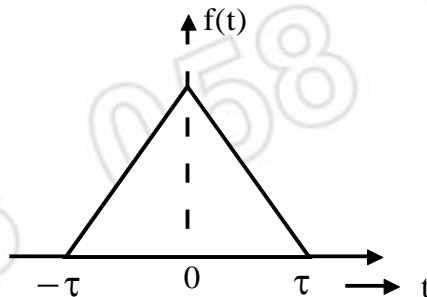


Fig. Q.1(b)

OR

2. a) What is frequency shifting property ? Explain the significance. Find the Fourier transform of $\cos\omega_c t$. 6

- b) State and prove frequency convolution & time convolution property of Fourier transform. **8**
3. a) A town has a population of 10,000 people of these 6000 are males & 4000 are females. Also 300 males and 400 females of this population are unemployed. An unemployed person is chosen at random. What is the probability that he is male ? **6**
- b) The probability density function is given as $f_x(x) = ae^{-b|x|}$ where x is r.v. whose allowable values range from $-\infty$ to ∞ . Find - **8**
- i) Relation between a and b
- ii) $P(1 \leq x \leq 2)$

OR

4. a) What is the difference between time average and ensemble ? How random variable differs from random process ? How will you identify an ergodic process ? **8**
- b) Determine the PSD and mean square value of the random process $x(t) = A \cos(\omega_c t + \theta)$ where θ is an RV uniformly distributed over $(0, 2\pi)$. **6**
5. a) Derive the PSD of unipolar signaling. **7**
- b) What is line coding ? Why is it necessary ? Explain the properties of line coding. **6**

OR

6. a) The data 10101011 is to be transmitted draw the waveforms for - **7**
- i) Unipolar RZ & NRZ
- ii) Polar RZ & NRZ
- iii) Bipolar RZ & NRZ
- iv) Split phase Manchester
- b) What is ISI ? Now Nyquist achieved zero ISI in his first criterion ? **6**
7. a) Why A-law & μ -law companding is employed ? explain in detail. **7**
- b) How delta modulation differs from adaptive delta modulation ? Explain. **6**

OR

8. a) What is amplitude modulation ? Derive the expression for AM signal. Consider carrier as $V_c \cos \omega_c t$. What is the range of modulation index in AM ? **6**
- b) What is frequency modulation ? Explain threshold effect in FM. **7**
9. a) Draw the ASK, PSK and FSK waveform for - **9**
- i) 11001100
- ii) 10011001
- iii) 11110000
- b) Explain many communication system. **4**

OR

10. a) What is the difference between matched filter and correlation detector. 6
- b) What do you understand by decision threshold and probability of error in matched filter. 7
11. a) The generator matrix for a (6, 3) block code is given below. Find all code vectors of this code. 5
- $$G = \begin{bmatrix} 100 & \vdots & 110 \\ 010 & \vdots & 011 \\ 001 & \vdots & 111 \end{bmatrix}$$
- b) The generator polynomial of a (7, 4) cyclic code is $g(x) = 1 + x + x^3$. Find any 08 codword of this code. 8

OR

12. a) A memoryless source emits six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08. Find the 4-ary (quaternary) Huffman code. Determine the average word length, the efficiency & redundancy. 6
- b) Discrete memory channel is shown in the figure with 3 input and 3 output symbols. 7

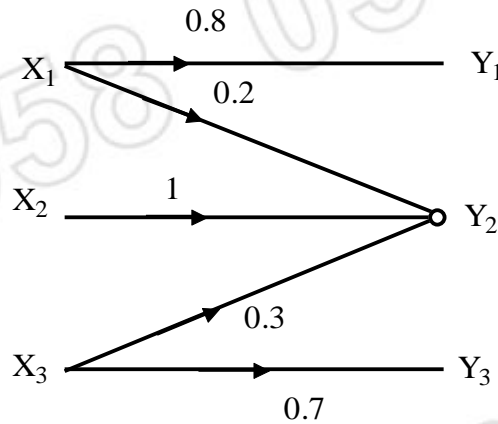


Fig. Q.12(b)

Calculate all entropies i.e. $H(x)$, $H(y)$, $H(x, y)$, $H(x/y)$ and $H(y/x)$ if $P(x_1) = 0.3$, $P(x_2) = 0.4$ and $P(x_3) = 0.3$
