33/80

SRK/KW/14/6990/6995

**Faculty of Engineering & Technology**
**Fourth Semester B.E. (ETRX/EC/ET) (C.B.S.)**
**Examination**
**SIGNALS AND SYSTEMS**
**(Electronics Engineering)**

Time—Three Hours] [Maximum Marks—80

**INSTRUCTIONS TO CANDIDATES**

(1) Answer **SIX** questions.

(2) All questions carry marks as indicated.

(3) Due credit will be given to neatness and adequate dimensions.

(4) Assume suitable data wherever necessary.

(5) Illustrate your answers wherever necessary with the help of neat sketches.

1. (a) State and prove time convolution and frequency convolution property. 7

(b) Evaluate Fourier Transform of a Trapezoidal function :

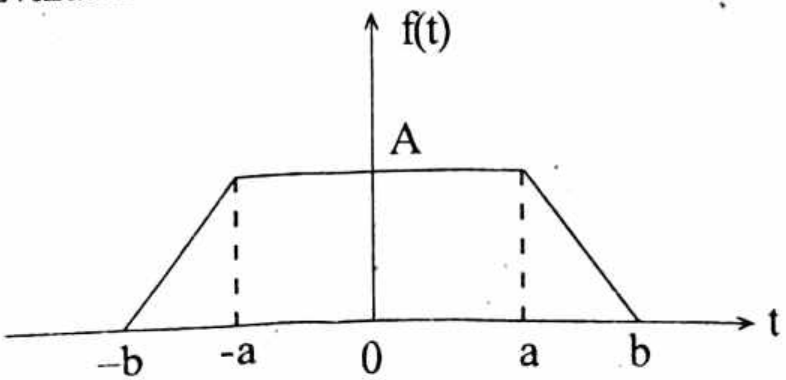


**Fig.1(b)** 6

**OR**

2. (a) State and prove time differentiation and frequency differentiation property of Fourier Transform. 7

(b) State and prove Sampling Theorem. 6

3. (a) A coin is tossed four times in Succession. Determine the probability of obtaining exactly two heads. 5

(b) The joint probability function of two random variable X and Y is given by :

$$f(x) = \begin{cases} C(x^2 + 2y); & \begin{matrix} x = 0, 1, 2 \\ y = 1, 2, 3, 4 \end{matrix} \\ 0 & ; \quad \text{otherwise} \end{cases}$$

find :

(i) The value of 'C'

(ii) $P(X = 2, Y = 3)$

(iii) $P(X \leq 1, Y > 2)$ and

(iv) Marginal probability functions of X and Y. 8

**OR**

4. (a) Explain the meaning of CDF and PDF. Also explain their properties. 8

(b) Define Conditional, Joint and Independent probability. 5

5. (a) Draw waveforms for Unipolar RZ., Bipolar RZ, Unipolar NRZ, Bipolar NRZ, and Manchester coding, for following sequence :

1011010. 10

(b) Explain causes and effect of Inter-symbol interference. 4

**OR**

6. (a) Derive expression of PSD in case of unipolar OR ON-OFF coding. Draw its spectrum. 7

(b) Explain Nyquist first criterion for zero inter-symbol interference. 7

7. (a) Differentiate between SSB-SC and DSB-SC techniques of modulation with their frequency spectrum. 7

(b) Explain advantages of DSB-SC modulation. Also explain in brief one detection method of DSB-SC wave. 6

**OR**

8. (a) Discuss about limitation of Delta Modulation with respect to :

(i) Slope overload Distortion

(ii) Hunting error OR Granular noise. 7

(b) State and draw the characteristics of following Compression Laws :

(i) μ-Law companding

(ii) A-Law companding. 6

9. (a) Draw ASK, FSK and PSK waveforms for following sequences :

(i) 1101011

(ii) 1011101. 6

(b) What is difference between PSK and DPSK ? Explain coherent detection method of DPSK. 7

**OR**

10. (a) What is decision threshold in Matched filter binary detection ? Find expression for decision threshold ($\lambda$). 7

(b) Write short notes on M-ary Communication. 6

11. (a) For a (7, 4) systematic cyclic code, the generator matrix is $g(x) = x^3 + x^2 + 1$. Find all corrected vectors for the following received vectors :

(i) 1011001

(ii) 1110010

(iii) 1111111

(iv) 1010110. 8

(b) A memoryless source emits two messages with probability of 0.2 and 0.8, find Binary Huffman code and efficiency. Also calculate code efficiency and redundancy for its second order extension i.e. N=2. 6

**OR**

12. (a) Show the channel capacity for a continuous channel is given by $C = B\log_2(1 + S/N)$ b/sec. 6

(b) A binary channel matrix is given by :

$$\text{Input} \begin{matrix} x_1 \\ x_2 \end{matrix} \begin{matrix} \text{Output} \\ y_1 \quad y_2 \end{matrix} \begin{bmatrix} 2/3 & 1/3 \\ 1/10 & 9/10 \end{bmatrix}$$

$P(x_1) = 1/3$, $P(x_2) = 2/3$, Determine

$H(x)$, $H(x/y)$, $H(y)$, $H(y/x)$. 8