Code No: 114DG

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B Tech II Year II Semester Examinations, May - 2016
PRINCIPLES OF COMMUNICATIONS
(Electronics and Instrumentation Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **(25 Marks)**

1.a) What is noise? What are the sources of noise? [2]
b) What is white noise? Draw its autocorrelation and power spectrum [3]
c) Compare FM and PM. [2]
d) What is Carson's rule? What is its use? [3]
e) A signal $m(t) = 2\cos 6000\pi t + 4\cos 8000\pi t + 6\cos 10000\pi t$ is to be truthfully represented by its samples. What is the minimum sampling rate from (i) low pass sampling theorem consideration; (ii) band pass sampling theorem. [2]
f) What is aliasing effect? How do you eliminate it? [3]
g) What is an M-ary modulation? What are its advantages and disadvantages? [2]
h) What is quantization error? How do you make it minimum? [3]
i) What is entropy? How do calculate it? [2]
j) What is the difference between error detection and error correction? [3]

PART-B **(50 Marks)**

2.a) Classify communication systems. Compare and contrast analog and digital communication systems.
b) Evaluate the thermal noise voltage developed across a resistor of 700 Ω. The bandwidth of the measurements is 7MHz, and the ambient temperature is 27^0C. [7+3]

OR

3.a) How do you calculate noise in linear systems for:
i) with single noise source;
ii) with multiple noise sources.
b) A parallel circuit is resonated at 200 MHz with a Q of 10, and a capacitance of 10pF. The temperature of the circuit is 17^0C. What noise voltage will be observed across the circuit by a wideband voltmeter? [7+3]

4.a) Suppose a non linear devices are available for which the output current i_0 and input voltage v_i are related by $i_0 = a_1 v_i + a_3 v_i^3$; where a_1 and a_3 are constants. Explain how these devices may be used to provide:
i) a product modulator and
ii) an amplitude modulator.
b) The centre frequency of an LC oscillator, to which a capacitive reactance FET modulator is connected, 70 *MHz*. The FET has a g_m which varies linearly from 1 to 2 ms, and a bias capacitor whose reactance is 10 times the resistance of the bias resistor. If the fixed tuning capacitance across the oscillator coil is 25 *pF*, calculate the maximum frequency deviation produced? [7+3]

OR

5.a) What are the advantages DSBSC over AM with full carrier? How do you produce DSBSC wave with a balance modulator? Describe in detail. Give the time and frequency domain description of DSBSC waves.

b) The RC load for a diode envelope detector consists of a 1000 *pf* capacitor in parallel with a 10 *kΩ* resistor. Calculate the maximum modulation depth that can be handled for sinusoidal modulation at a frequency of 10 *kHz* if diagonal peak clipping is to be avoided? [7+3]

6.a) What is multiplexing? What is its need? Describe in detail about Frequency Division Multiplexing (FDM).

b) How do you generate and detect PAM waves? [7+3]

OR

7.a) State and prove low pass sampling theorem. Describe what is under sampling, nyquist sampling and over sampling.

b) How do you generate and detect PPM waves? [7+3]

8.a) Draw the block diagram of Pulse Code Modulation. Describe the principle of working of each block.

b) What are advantages of digital communications? [7+3]

OR

9.a) Derive the equation for probability of error in non coherent ASK.

b) What is slope overload distortion and granular distortion? How do you eliminate them? [7+3]

10.a) Five source messages are probable to appear as $m_1 = 0.4$, $m_2 = 0.15$, $m_3 = 0.15$, $m_4 = 0.15$ and $m_5 = 0.15$. Find the coding efficiency for:
i) Shanon-Fano coding and
ii) Huffman coding.

b) A code is composed of dots and dashes. Assume that the dash is 3 times as long as the dot and has one third the probability of occurrence.
i) Calculate the information in a dot and that in a dash,
ii) Calculate the average information in the dot-dash code,
iii) Assume that a dot lasts for 10 ms and that this same time interval is allowed between symbols. Calculate the average rate of information transmission. [7+3]

OR

11.a) The generator polynomial of a (15,11) Hamming code is defined by $g(x)=1+x+x^4$, develop the encoder and syndrome calculator for this code, using a systematic form for the code.

b) Write a short note on Convolutional codes. [7+3]

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