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Total number of printed pages – 3

B. Tech
PCEC 4305

Sixth Semester Regular Examination – 2015

DIGITAL COMMUNICATION TECHNIQUES

BRANCH : EC, ETC

QUESTION CODE : J 204

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.*



1. Answer the following questions :

2×10

- (a) Write down the difference(s) between thermal noise and white noise. Give the PSD of each.
- (b) Explain the role of a sample and hold circuit. Give a diagram.
- (c) Why a logarithmic function is used for companding ? Give an example.
- (d) How much bandwidth is needed to transmit the T1 speech ?
- (e) Suggest a suitable demodulation scheme for DPSK with the help of a neat diagram.
- (f) Give the Euclidean distance between the signals in BFSK. Compare it with that in BPSK.
- (g) Does bipolar signaling possess self synchronizing capability ? Explain.
- (h) Can a signal be recovered if the SNR measured at the receiver input is 0dB ? Explain.

P.T.O.

- (i) Can you demodulate OQPSK by envelope detection ? Justify.
- (j) Suggest a suitable squaring circuit. Explain it squares a give input signal.

2. Assume that a bandlimited function, $m(t) = \frac{\sin 20 \pi t}{\pi t}$, is sampled at 19 samples per second. The sampling function is a unit height pulse train with pulse widths of 1 msec. The sampled waveform forms the input to a low pass filter with cutoff frequency 10Hz. Find the output of the low pass filter and compare this with the original signal $m(t)$. 10

3. (a) Design a time-division multiplexer that will accommodate 8 channels. Assume that the sources have the following specifications : 5

Source 1. Analog, 2-KHz bandwidth

Source 2. Analog, 4-KHz bandwidth

Source 3. Analog, 2-KHz bandwidth

Sources 4-8. Digital, synchronous at 9600 bits/sec

(b) Derive the impulse response of the reconstruction filter. 5

4. Compute the Euclidean distance between any two consecutive signal points in 8-PSK. What information do you obtain from this expression ? 8+2

5. (a) Sketch the phase trellis for an MSK signal when the modulating bit stream is $\{1, 1, -1, -1, -1, 1, -1, 1, 1, -1\}$ 5

(b) Suggest a suitable demodulator for BFSK signals. 5

6. (a) What do you understand by an optimum receiver ? Suggest one such receiver. Prove that it is indeed optimum. 1+1+4

(b) Give the impulse response of the optimum receiver you worked out in 6(a) corresponding to a triangular pulse of height 1 volt and duration 5 ms. Show your steps clearly. 4

7. (a) A DMS produces alphabets A, B, C, D, E, F and G with the probabilities given as {0.08, 0.2, 0.12, 0.15, 0.03, 0.02, 0.4} Construct a Huffman code for this source and determine the average length of the codeword. 6 + 1
- (b) Determine the coding efficiency of your code designed in 7(a). 3
8. Write short notes on any **two** of the following : 5 × 2
- (a) Differential PCM
- (b) Efficiency of orthogonal transmission
- (c) Nyquist's criteria for zero ISI
- (d) Quantization noise in delta modulation.

