

B.TECH / ECE / 5TH SEM/ ECEN 3105/2017
DIGITAL COMMUNICATION
(ECEN 3105)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

***Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.***

***Candidates are required to give answer in their own words as far as
practicable.***

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In digital transmission, the modulation technique that requires minimum bandwidth is
(a) Delta modulation (b) PCM (c) DPCM (d) PAM.
- (ii) The minimum sampling frequency (in samples/sec) required to reconstruct the signal $X(t) = 7(\sin 2\pi 1000t)^2 + 5(\sin 2\pi 750t)^3$ from its samples without distortion
(a) 4000 KHz (b) 4500 KHz (c) 5000 KHz (d) None of these.
- (iii) If the number of bits/per sample is increased from n to $n+1$, the increase in signal to quantization noise ratio will be
(a) 3dB (b) 6dB (c) $2n$ dB (d) n dB.
- (iv) The bit rate for a digital communication system is 64 Mbps. The modulation scheme is QPSK. The baud rate of the system is
(a) 64 Mbps (b) 128 Mbps (c) 32 Mbps (d) 8 Mbps.
- (v) Which of the following digital modulation techniques is used for GSM mobile system
(a) PSK (b) O-QPSK (c) MSK (d) GMSK.
- (vi) A rectangular pulse of duration T is applied to a matched filter. The output of the filter is
(a) rectangular pulse of duration T .
(b) rectangular pulse of duration $2T$.
(c) triangular pulse.
(d) sine function.

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- (vii) Output SNR in a DM system for a 1 KHz sinusoid sampled at 32 KHz, without slope overload and followed by a 2 KHz post reconstruction filter is
(a) 156 (b) 312 (c) 624 (d) 1248.
- (viii) PCM generation requires a LPF at the beginning to
(a) eliminate quantization noise
(b) eliminate Aliasing effect
(c) eliminate decoding noise
(d) none of these.
- (ix) In a PCM system, number of quantization levels are 32 and the maximum signal frequency is 4 KHz, the minimum BW of the required transmission channel is
(a) 40 kbps (b) 256 kbps (c) 512 kbps (d) 1 mbps.
- (x) If the number of bits/per sample is increased from 5 to 7, the increase in signal to quantization noise ratio will be
(a) 8 (b) 16 (c) 32 (d) 64.

Group - B

2. (a) What is the difference between natural sampling and flat top sampling?
(b) What is aperture effect ?
(c) Why companding is used in PCM?
(d) A television signal having a B.W of 4.2 MHz is transmitted using binary PCM system. Given that the no of quantization level is 512. Determine i) code word length ii) transmission B.W iii) Final bit rate iv) output signal to quantization noise ratio.
- 2 + 2 + 4 + (1 + 1 + 1 + 1) = 12**
- 3.(a) With a neat block diagram, explain the generation of Delta Modulation (DM).
(b) Explain the limitations of Delta modulation.
(c) A DM system is designed to operate at 3 times the Nyquist rate for a signal with a 4 KHz Bandwidth. Determine the maximum amplitude of a 1 KHz input sinusoid for which the DM does not show slope-overload. Given that quantization step size is 200 mV.

4 + 4 + 4 = 12

Group – C

4. (a) Compare the performances of different Line codes.
 (b) Describe the working principle of a Regenerative Repeater.
 (c) A communication channel of bandwidth 75 KHz is required to transmit binary data at a rate of 0.1 Mbps using raised cosine pulses. Determine roll off factor.
5. (a) What does the term equalization refer to?
 (b) Explain how it is carried out by using transverse filters.

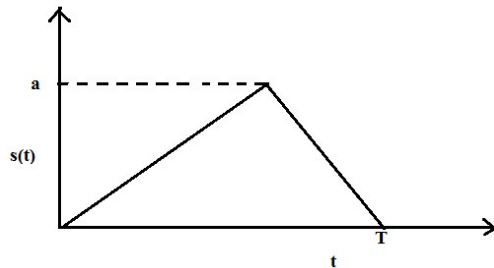
$$6 + 4 + 2 = 12$$

$$2 + 10 = 12$$

Group – D

6. (a) Define a matched filter and compare its functioning with a correlator.
 (b) Explain how a matched filter can maximize SNR for a given transmitted symbol.
7. (a) What is an Optimum filter? When is it called a matched filter?
 (b) Draw the impulse response of the matched filter with the waveform given below as its input.

$$6 + 6 = 12$$



- (c) Compare the noise performance of the coherent and non-coherent receivers.

$$(2 + 2 + 2) + 6 = 12$$

Group – E

8. (a) Why non-coherent detection of PSK signal is not possible.
 (b) With suitable diagram, describe how the need of synchronization can be avoided in DPSK system.

- (c) The binary sequence 110010110 is applied to a DPSK transmitter. Show the differentially encoded sequence with phase and its reconstruction.

$$2 + 5 + 5 = 12$$

9. (a) With suitable diagram, explain the working principle of BPSK transmitter.
 (b) Non coherent detection of BPSK modulated signal is not possible – justify the statement.
 (c) Obtain the bit error probability of coherently detected BPSK modulation scheme.

$$4 + 4 + 4 = 12$$