

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2125)

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B. Tech 4th Semester Examination
Digital Communication (OS)
EC-4010

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

- Note :** (i) The question paper consists of five sections A, B, C, D and E.
(ii) Attempt five question in all selecting one question from section A, B, C and D.
(iii) Section E is compulsory.

SECTION - A

- (a) Define sampling theorem for band limited signal and draw a circuit to sample the signals.
(b) Find the Nyquist rate of sampling for the signal $x(t) = \text{sinc}(200t) + \text{sinc}^2(200t)$? Can we retrieve a signal back by sampling it below nyquist rate, justify your answer also. (10+10=20)
- What is delta modulation? Draw the receiver and transmitter circuits for the delta modulation. Also discuss the comparison of delta modulation with pulse code modulation. (20)

SECTION - B

- (a) Explain a coherent binary PSK transmitter and receiver.
(b) Explain the principle of a QPSK system. Compare binary PSK and QPSK scheme on the basis of performance parameters. (10+10=20)

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- A binary data is transmitted using a ASK over a AWGN channel at a rate of 2.4 Mbps. The carrier amplitude at the receiver is 1mV. The noise power spectral density $N_0/2 = 10^{-15}$ Watt/Hz. Find the average probability of error if the detection is coherent. (take $\text{erfc}(5) = 3 \times 10^{-6}$). (20)

SECTION - C

- Find the output of a matched filter and determine the maximum value of S/N_0 if the input $s(t)$ is a rectangular pulse of amplitude A and duration T . (20)
- What do you mean by an optimum receiver with reference to a digital modulation scheme? Draw its diagram. Also explain the merits and demerits of an optimum filter by taking a practical application. (20)

SECTION - D

- (a) What are the types of quantization? Show and differentiate them by taking suitable input signal.
(b) With diagrams explain in detail, the operation of a DPCM transmitter and receiver. (10+10=20)
- (a) Consider a speech signal with a maximum frequency of 3.4KHz and maximum amplitude of 1 Volt, the speech signal is applied to a D.M. With its bit rate at 20kbts/sec., discuss the choice of an appropriate step-size for the delta modulator.
(b) A PCM and DM are both designed to yield an output SNR of 30dB. Let $f_m = 4\text{kHz}$ and assume PCM sampling at 5 times the nyquist rate. Compare the bandwidths for both the systems. If $f_1/f_m = 0.4$, compare the threshold of both the systems. (10+10=20)

SECTION - E

(Each question carry 2 marks each)

9. (a) A signal contains components with frequencies up to 50 kHz, although no useful information is contained at frequencies above 45 kHz. What is the minimum frequency at which the signal should be sampled?
- (b) What do you mean by bit rate and baud rate?
- (c) Discuss the problems associated with quantization.
- (d) State True or False and Justify that:
PAM is a digital modulation technique.
- (e) What is the difference between coherent & non-coherent digital modulation techniques?
- (f) Is PSK a digital modulated signal? Justify your answer.
- (g) Derive the condition for no slope overload distortion in delta modulation scheme.
- (h) Give the Properties of a matched filter.
- (i) Write short note on ISDN.
- (j) Write short note on ATM. (2×10=20)