CSE Discipline: Data Communication: Course No.: ECE 3251

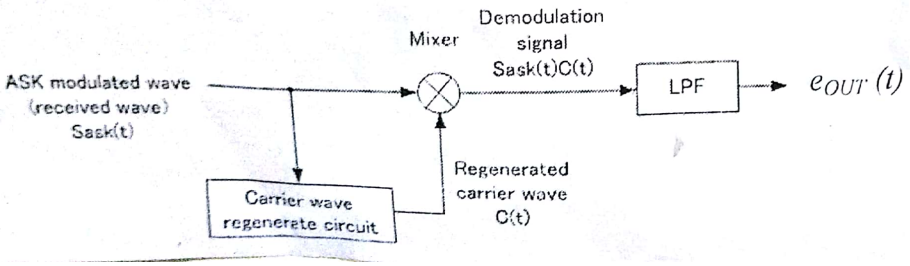
Class Test-1:Marks-15:Time 25minutes

Q1. State Sampling theorem. What is the need for sampling? 4

Q2. What is the function of a carrier? 1

Q3. Draw the waveforms for ASK, FSK and PSK of the data: 00101100 7

Q4. What is the e_{OUT} *(t)* of the following block diagram: 3



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application Class Test-2:Marks-15:Time 20minutes

Q1. Give one example of each of PAM, PWM and PPM. 03

Q2. Define TDM. Through figure show how multiplexing of three channels is performed. 05

Q3. Graphically derive a PPM wave from a PWM wave. 07

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Class Test-3: Marks-20: Time-25min

Q1. What do you mean by constellation diagram? What is the use of it? Draw the signal-space representation of '32-QAM'. 10

Q2. Why do we shape the baseband response of a system? Draw the waveform of the 'data: 11000000001100000101' using i) Bipolar RZ; ii) Gray Code; iii) B8ZS and iv) HDB3. 10

Date: 07/12/2017

KHULNA UNIVERSITY, KHULNA
Computer Science and Engineering Discipline

3rd Year Term: II Session: 2016 – 2017 Examination: 2017
Course No: ECE 3251 Course Title: Data Communication
Full Marks: 60 Time: 03 Hours

- The Figures in the margin indicate full Marks. The questions are of equal value.
- Use separate sheet for each section.

SECTION A

There are **FOUR** questions in this section. Answer any **THREE** questions. **Marks**

1. a) Explain how data is transmitted through a typical data communication system. 02

b) Make a comparison among PAM, PWM, and PPM. 03

c) Three information signals are to be sent using time-division multiplexed PAM. Draw a figure to show this multiplexing, and explain shortly. 05

2. a) What is aperture effect? How can it be minimized? 02

b) Show that "Amplitude distortion as well as a delay of T/2 is achieved using flat-top samples." 04

c) An important signal, s(t), is pulse position modulated (PPM). Find out its corresponding pulse width modulated (PWM) wave. 04

3. a) Define SNR. Explain a differential pulse-code modulation system with necessary figure. Also, find the output signal-to-quantization noise ratio of DPCM. 05

b) Explain the types of quantization noise in delta modulation. 03

c) Prove that, $(SNR)_o|_{max} = \frac{3}{8\pi^2 w f_0{}^2 T_s{}^2}$ [Symbols hold their usual meaning.] 02

4. a) What is meant by carrier recovery? Show how the carrier may be recovered from a QPSK signal. 04

b) Describe FDM. Show the spectrum of the composite baseband signal and the FDM signal. 03

c) A sinusoidal carrier has a peak value of 5v and frequency of 100MHz. It is modulated with a binary digital message 101111. Draw the modulated waveforms for: (i) ASK, (ii) FSK, and (iii) PSK. 03

SECTION B

There are **FOUR** questions in this section. Answer any **THREE** questions.

5. a) Draw the waveform of the "data: 11100000000001" using the following data shaping formats. Assume that the last non-zero signal level has been positive. (i) Polar RZ, (ii) Differential encoding, (iii) B8ZS, and (iv) HDB3 (the number of non-zero pulses is odd after the last substitution). 04

b) What is the maximum possible band rate of a voice channel having bandwidth of 3100Hz? 01

c) Explain the fundamental concept of a constellation diagram. Draw the signal space representation of '32-QAM' with symbols. 05

6. a) Define error probability. 02

b) Derive the error probability for polar signal. 05

c) Polar binary pulses are received with peak amplitude, $A_p = 1mV$. The channel noise rms amplitude is 192.3μV. Threshold detection is used, and 1 and 0 are equally likely. Find the detection error probability. Adjust the amplitude of the pulse to keep the transmitted power same and find the error probability for on-off and bipolar case. 03

Table for Q(x)

x	Q(x)
3.00	0.1350×10^{-2}
3.50	0.2326×10^{-3}
3.68	0.1166×10^{-3}
4.00	0.3167×10^{-4}
5.00	0.2867×10^{-6}
5.20	0.9964×10^{-7}
5.60	0.1072×10^{-7}

7. a) Describe the asynchronous transmission mode. 03

b) We want to transmit 1000 characters with each character encoded as 8 bits. Find the number of transmitted bits for synchronous and asynchronous transmission modes. 04

c) What is the purpose of cladding in an optical fiber? Name the advantages of optical fiber over twisted-pair and co-axial cable. 03

8. a) State channel coding theorem. 02

b) Explain how the channel capacity varies with the probability of error. 03

c) Assume a message bit be 100100 and divisor be 1101. Find the message bit polynomial and divisor polynomial. What will be the polynomial of sending data after adding CRC? 05