

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2487

Roll No.

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B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

DIGITAL COMMUNICATIONS

Time : 3 Hours

Total Marks : 100

- Note :** (1) Attempt all questions.
(2) Assume the missing data if any.
(3) Marks are indicated at the end of each Section.

1. Attempt any **four** parts of the following : **(5×4=20)**
- (a) The spectral range of a bandpass signal extends from 10.0 MHz to 10.04 MHz. Find the minimum sampling rate.
 - (b) Calculate the capacity of a Gaussian channel with a bandwidth of 1 MHz and S/N ratio of 20 dB.
 - (c) Discuss the term FSK, PSK and DPSK.
 - (d) Discuss the role of Equalizer. Also explain the role of normalized equalization.
 - (e) Explain the importance of Companding technique.
2. Attempt any **two** parts of the following : **(10×2=20)**
- (a) Differentiate between the Delta Modulation technique and Adaptive Delta Modulation technique. Explain how ADM improves the system's tolerance to slope overload.

- (b) Consider five messages given by the probability $1/2$, $1/4$, $1/8$, $1/16$ and $1/16$. Calculate H . Use the Shannon-Fano algorithm to develop an efficient code, and for that code, calculate the average number of bits/message.
- (c) Write in brief on conditional Entropy and Redundancy. One of the four possible messages M_1 , M_2 , M_3 and M_4 having probabilities $1/8$, $3/8$, $3/8$ and $1/8$ respectively is transmitted. Calculate the average information per message.

3. Attempt any two parts of the following : $(10 \times 2 = 20)$

- (a) What is the purpose of Hamming code ? A receiver receives the code 11001100111. When it uses the Hamming encoding algorithm, the result is 0101. Which bit is in error ? What is the correct code ?
- (b) Define the term Burst error and Error detection. How many types of redundancy checks are used in data communications ? Discuss in brief VRC.
- (c) A sinusoidal signal with an amplitude of 5.25 V is applied to a uniform quantizer of mid-tread type. The quantizer output takes on values 0, ± 1 , ± 2 , ± 3 , ± 4 and ± 5 Volts. Sketch the waveform of the resulting quantizer output for one complete cycle of the input.

4. Attempt any two parts of the following : $(10 \times 2 = 20)$

- (a) Draw the block diagram of QPSK coherent receiver. Sketch the QPSK waveform for the sequence 1101010010, assuming the carrier frequency to be equal to the bit rate.

- (b) How does a binary PSK signal generated ? Suggest a suitable synchronizing circuit arrangement for extracting the carrier at the receiver end for coherent detection of binary PSK.
- (c) Compare the noise performance of different digital modulation schemes.
5. Write in brief on any **four** of the following : (5×4=20)
- (a) Central limit theorem
 - (b) Code Division Multiple Access of DSSS
 - (c) OFDM Communications
 - (d) M-ary Digital Carrier Modulation
 - (e) Encoder and decoders for systematic cycle codes.