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B.TECH.
(SEM-V) THEORY EXAMINATION 2021-22
ANALOG & DIGITAL COMMUNICATION

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

- 1. Attempt all questions in brief. 2 x 10 = 20**
- a. Define modulation, Amplitude modulation & Angle Modulation.
 - b. Draw the Block Diagram of communication system and mention the name of each block.
 - c. What is frequency deviation of FM signal?
 - d. Define Modulation index and percentage modulation in case of FM.
 - e. Explain briefly, signal to noise ratio.
 - f. Discuss Nyquist criteria for sampling.
 - g. Draw the signal waveform of PAM, PWM & PPM.
 - h. Explain briefly, Quantization process.
 - i. What do you understand by Shannon Hartley Theorem?
 - j. What is Electronic Commutator in TDM system?

SECTION B

- 2. Attempt any three of the following: 10 x 3 = 30**
- a. Why is modulation needed?
 - b. Differentiate between Narrowband FM and Wideband FM with their frequency spectrum and suitable mathematical expressions.
 - c. Explain coherent method of generation and detection of PAM signal with suitable mathematical expressions.
 - d. Compare ASK, PSK & FSK. Also give the advantages and disadvantages of ASK, PSK & FSK.
 - e. Explain Time Division Multiplexing (TDM) technique with suitable diagram.

SECTION C

- 3. Attempt any one part of the following: 10 x 1 = 10**
- (a) Why Super heterodyne receiver is better than the TRF receiver? Explain.
 - (b) An arbitrary modulating signal consisting of two modulating frequencies of 1 kHz and 2 kHz modulated a carrier signal having peak amplitude level of 1 V and frequency of 1 MHz, with amplitude modulation index of 0.5 and 0.2 respectively. Write the resultant expression for complex AM signal and sketch its frequency spectrum.
- 4. Attempt any one part of the following: 10 x 1 = 10**
- (a) What is Noise. Explain various forms of Noise and its sources.



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- (b) An FM modulator operates at carrier-signal frequency of 500 KHz having peak amplitude of 10 V. A modulating frequency (f_m) of 10 KHz modulates it with a peak frequency deviation (δ) of 10 KHz. From the Bessel function table, it is observed that a frequency modulation index of one yield three sets of significant sidebands. Compare actual minimum bandwidth as obtained using Bessel function and the approximate minimum bandwidth using Carson's rule.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the working of Delta Modulation. How adaptive Delta modulation improves the performance of Delta modulation?
- (b) Let the maximum spectral frequency component (f_m) in an analog information signal is 3.3 KHz. Illustrate the frequency spectra of sampled signals under the following relationships between the sample frequency, f_s and maximum analog signal frequency, f_m –
- (i) $f_s = 2 f_m$
- (ii) $f_s > 2 f_m$

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) What is pulse code modulation (PCM)? Explain briefly, generation and detection of PCM.
- (b) A Discrete Memoryless Source X has five symbols (s_0, s_1, s_2, s_3, s_4) and their probabilities of occurrence are given as 0.40, 0.20, 0.20, 0.10, 0.10, respectively. Construct Huffman Code and calculate efficiency.

7. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain T-1 carrier system with the help of block diagram.
- (b) Consider 8 different alphabet source with probability of occurrence are given in Table – 1

| SYMBOL | A | B | C | D | E | F | G | H |
|-------------|------|------|------|------|------|------|------|------|
| PROBABILITY | 0.30 | 0.20 | 0.15 | 0.12 | 0.10 | 0.07 | 0.04 | 0.02 |

Table – 1

According to Shannon – Fano technique generates binary code and calculates average word length, Entropy, and efficiency.