THEORY EXAMINATION

Month & year of Exam- **Question paper**
**May, 2024**
Programme- **B.Tech 4th semester**
Subject- **ECPC-210 Digital Communication**
Maximum marks- **50** Time allowed- **3 hours**

**Note: Solve any five questions.**

Q.1 (a) Describe the characteristics and advantages of raised cosine spectrum in baseband pulse transmission. How does it address the trade-off between bandwidth efficiency and ISI suppression? (5)

(b)A baseband binary PCM signal is transmitted over a channel with a bandwidth of 4 kHz. If the symbol rate is 8 kbps, calculate the Nyquist pulse shape bandwidth required to satisfy the Nyquist criterion for distortionless transmission. (5)

Q.2 (a) Explain the principle of maximum likelihood decoding in the context of signal detection. How does it optimize the detection of a known signal in the presence of noise? (5)

(b) A digital communication system transmits QPSK-modulated symbols with a signal-to-noise ratio (SNR) of 20 dB. Calculate the bit error rate (BER) assuming coherent detection. (5)

Q.3 (a)Explain the concept of bandwidth efficiency in the context of modulation schemes. How is bandwidth efficiency related to the constellation size and signaling rate of the modulation scheme? (5)

(b) Draw the various waveforms corresponding to BPSK modulation for the binary sequence 11001001 (5)

Q.4 (a)Discuss the relationship between signal space dimensionality and processing gain in spread spectrum communication. How does increasing the signal space dimensionality improve the system's performance in terms of noise immunity and multipath mitigation? (5)

(b) In a direct sequence spread spectrum system with a spreading factor of 10 and a data rate of 1 Mbps, calculate the processing gain achieved by spreading the signal across a wider bandwidth. (5)

Q.5 (a) Discuss the concept of signal space analysis and its relevance in designing optimum receivers for digital communication systems. How does the geometric interpretation of signals aid in understanding signal detection, demodulation, and error performance analysis? (5)

(b) Describe a QASK modulation and demodulation system. (5)

Q.6 (a) Consider a data sequence 11000111. Draw the various waveforms for generation of MSK signal assuming $f_H = 1.5f_b$ and $f_L = f_b$. (5)

(b) write equation for the MSK waveform and obtain the signal space representation and also explain how is phase continuity is maintained in MSK waveform? (5)

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