Supplementary Examination, Feb. 2019

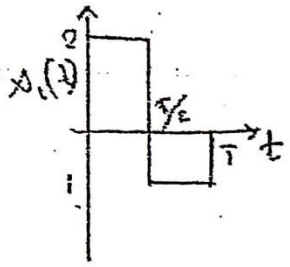
BTech. V Sem. EC-301. DIGITAL COMMUNICATION

Maximum Marks-40. Time-3 hours.

Answer any five questions.

All questions carry equal marks.

1. Sketch the impulse response of the filter matched to the signal s(t) as shown below:



Also derive the expression of impulse response of the filter matched to signal s(t). (3+5)

2. In ON-OFF keying of a carrier modulated signal, the two possible signals are

$$s_0(t) = 0 \qquad 0 \le t \le T_b$$

$$s_1(t) = \sqrt{\frac{2E_b}{T}} \cos 2\pi f_0 t \qquad 0 \le t \le T_b$$

The corresponding received signals are

$$r(t) = n(t) \qquad 0 \le t \le T_b$$

$$r(t) = \sqrt{\frac{2E_b}{T_b}} \cos 2\pi f_c t \qquad 0 \le t \le T_b$$

Where n(t) is additive White Gaussian Noise with PSD N/2 watts/Hz. Derive the probability of error for the detector. (8)

3. Construct a duo-binary coder for a binary sequence {bn} and derive the time domain and frequency domain characteristics of the duo-binary signal. (8)

4. Explain binary frequency shift keying (FSK) with its constellation diagram. Find the. (8) expression of probability of error for FSK received signal in presence of AWGN noise with PSD N/2 watts/Hz.

5. a) Explain with block diagram the principle of Frequency-hopped spread spectrum. (4+4)
   b) Explain how PN- sequences are generated.

6. a) Explain binary PCM system with block diagram. (2+3+3)
   b) Why we need quantisation? Explain A-law of quantisation.
   c) A signal m(t) with dynamic range equal to 2V is uniformly quantised by a M- level quantiser. Each quantised levels are encoded by n number of binary bits. Find the maximum signal to quantisation noise ratio in dB assuming that quantisation noise has uniform probability distribution within each quantum step.

7. Explain the following: (4+4)
   a) Chebyshev's Inequality.
   b) Central limit theorem.