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Invigilator's Signature :	

CS/M.Tech (ECE)/SEM-1/MMC-105/2009-10 2009 COMMUNICATION THEORY AND INFORMATION SYSTEM

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. $5 \times 14 = 70$

- 1. a) A BPSK signal is represented by $S(t) = b(t)\sqrt{2p}\cos(2\pi f_c t + \theta)$ where b(t) is a rectangular pulse of amplitude $\pm v_b$ and of duration T_b . Deduce the PSD function of modulating signal and modulated signal. Draw the corresponding spectrum and the signal space diagram.
 - b) A train of pulse be represented as and the base band signal is shown in the figure.

Using the concept of convolution theorem and the shift property of delta function, calculate the sampling signal g(t) and draw the corresponding waveforms. 7

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- 2. a) Three voice signals $X_1 = 10\cos(2\pi \times 100 + 0.5\pi)$, $X_2 = 15\sin(400\pi + \pi)$ and $X_3 = 5\sin(500\pi - 0.5\pi)$ are applied to the input of FDMA transmitter. Using suitable modulation technique receive the signal separately at the receiver end. 7
 - b) A distorted PAM signal is received by the receiver antenna. Using synchronous pulse detector as a reference pulse receive the modulating signal successfully at the end.
- a) Write down the expression of a QPSK signal and draw the corresponding phasor diagram. Using bipolar NRZ as a modulating signal, explain the waveform of QPSK. 8
 - b) In an ASK modulation scheme, the base band signal represented as 101101001 modulates a cosinusoidal carrier of frequency f_c . Employing suitable active device draw the modulated waveform. 6
- 4. a) Explain with suitable diagram the generation of PWM signal.5
 - b) Using the concept of probability density function show that the mean square quantization error $e^2 = \frac{S^2}{12}$, where S = step size.

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- c) The information in an analog signal voltage waveform is to be transmitted over a PCM system with an accuracy of $\pm 0.1\%$ (full scale). The analog voltage has a BW of 100 Hz and amplitude ranges from + 10 V to - 10 V. Find
 - i) minimum sampling rate
 - ii) number of bits in each PCM word
 - iii) minimum bit rate required
 - iv) channel bandwidth.

5

5. a) A frequency modulated wave represented as

 $S(t) = A \cos \left[W_c t + K f \int x(t) dt \right]$

(where the notations have their usual meaning) is applied at the input of a phase discriminator. How do you demodulate the FM wave by the following conditions ?

- i) At resonance
- ii) At lagging phase
- iii) At leading phase. 8
- b) Using first order PLL, demodulate a single tone FM wave.

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block code is expressed as

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	1	1	1	0	1	0	0
[H] =	1	1	0	1	0	1	0
	1	0	1	1	0	0	1

Obtain the generator matrix (G).

- Using adaptive method show how the problem of slope b) overload in DM can be solved. 6
- $4 \times 3\frac{1}{2}$ 7. Write short notes on any *four* of the following :
 - Shannon–Fano coding a)
 - Hartley-Shannon law for AWGN channel b)
 - c) VSB modulation
 - 16-QAM d)

6.

a)

- A-law & μ law. e)
- $4 \times 3\frac{1}{2}$ Write short notes on any *four* of the following : 8.
 - E-R diagram a)
 - Decision table b)
 - Data dictionary c)
 - Physical and logical data flow diagram d)
 - e) Requirement analysis
 - f) Entropy.

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