

**Total No of Questions: [12]****SEAT NO. :** **[Total No. of Pages : 3]*****T.E. 2008 (Digital communication)******(Semester - I)******Time: 3 Hours******Max. Marks : 100******Instructions to the candidates:***

- 1) Answers three Question from sections I and answers three Question from sections II. Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8 , Q.9 OR Q.10, Q.11 OR Q.12***
- 2) Answers to the two sections should be written in separate book.***
- 3) Neat diagrams must be drawn wherever necessary.***
- 4) Figures to the right side indicate full marks.***
- 5) Use of Calculator is allowed.***
- 6) Assume Suitable data if necessary***

**SECTION I**

Q1)	a)	Waveform $g(t) = 20 + 20 \sin(500t + 30)$ , is to be sampled periodically and reproduced from these sample values-  <ol style="list-style-type: none"> <li>1. Find the maximum allowable time interval between sample values.</li> <li>2. How many sample values need to be stored in order to reproduce 1 sec of this waveform if sampled according to the results in 1.</li> <li>3. Determine and sketch the spectrum of the sampled signal when sampling frequency <math>f_s = 750</math> Hz.</li> </ol>	[8]
	b)	What is aperture effect? What is the effect of pulse duration on aperture effect?	[8]
		OR	
Q2)	a)	A voice signal band limited to 3.4kHz is to be transmitted using PCM system. The signalling rate of the PCM is not to exceed 36000bits/sec find. <ol style="list-style-type: none"> <li>a. The number of digits (bits) per word.</li> <li>b. The number of quantization levels.</li> <li>c. Range of sampling frequency</li> </ol>	[8]
	b)	Draw the block diagram of DM system and explain its working with waveforms. Comment on the drawbacks of DM.	[8]
Q3)	a)	Explain important parameter of line codes with example.	[8]
	b)	What is a synchronizer? Explain any one type of bit synchronizer.	[8]
		OR	
Q4)			
	a)	Write short note on three tap preset equalizer and adaptive equalizer.	[8]

	b)	Three channels are to be multiplexed using TDM technique. The rate of each channel is 150 bytes per second. In TDM, one byte per channel is to be multiplexed. Draw the system block diagram and Calculate 1. Frame size 2. Frame duration 3. Frame rate and 4. Bit rate of TDM signal	[8]
Q5)	a)	Define the terms related to random processes a) Mean b) Auto correlation c) Power spectral density with mathematical formula	[8]
	b)	Two random processes $x(t)$ & $y(t)$ are given by $X(t) = A \cos(\omega t + \Theta)$ & $y(t) = A \sin(\omega t + \Theta)$ Where $A$ & $\omega$ are constants & $\Theta$ is a random variable having a uniform distribution over $[0, 2\pi]$ , find the cross correlation of $X(t)$ & $Y(t)$ ?	[10]
		OR	
Q6)	a)	Define random process and with the help of mathematical expression explain 1. Stationary random processes 2. Non- Stationary random processes 2. Wide sense stationary processes 3. Ergodic processes	[10]
Q6)	b)	What is noise? Explain in detail different types of noise	[8]
		<b>SECTION II</b>	
Q7)	a)	Describe with the help of block diagram BFSK system transmitter and receiver. Draw the spectrum of BFSK and State the bandwidth requirement.	[8]
	b)	Compare and contrast A) BPSK & BFSK B) 16 PSK & 16 QAM	[8]
		OR	
Q8)	a)	With the help of mathematical expression and block diagram, Explain the operation of offset QPSK. Also express the bandwidth requirement?	[8]
	b)	Explain MSK with suitable waveform and prove phase continuity in MSK.	[8]
Q9)	a)	Derive expression for the probability of error of BPSK system	[8]
	b)	Binary data transmitted using PSK at the rate of 2 Mbps over RF link having bandwidth 2Mhz. Find signal power required at receiver input so that error probability is less than or equal to $10^{-4}$ . Assume noise PSD to be $10^{-10}$ W/Hz ( $Q(3.71) = 10^{-4}$ ).	[8]

		OR	
Q10)	a)	State various properties of matched filter. Explain the impulse response in detail.	[8]
	b)	Explain in detail operation of CDMA technique and compare performance parameters of FDMA, TDMA and CDMA	[8]
Q11)	a)	State and explain properties of PN sequence	[6]
	b)	Write a short note on radio link budget analysis	[6]
	c)	Write a short note on Noise temp and G/T ratio.	[6]
		OR	
Q12)	a)	Explain FHSS Transmitter and receiver with suitable block diagram.	[8]
	b)	A DS-SS BPSK system has $f_b=3\text{kbps}$ $N_o = 10^{-10}$ W/Hz and in receiving signals with $P_e=10^{-7}$ in the presence of single tone jammer whose received power is ten times larger than original signal. Calculate jamming margin and draw anti-jam characteristics	[10]