Code: A-15

Subject: COMMUNICATION ENGINEERING

December 2005

Time: 3 Hours

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or best alternative in the following:

(2x10)

- a. Error signals associated with the sampling process are called
 - **(A)** Fold over distortion.
- **(B)** Aliasing

(C) Nyquist rate

- (D) A and B
- b. When the message and the BCC are transmitted as separate parts within the same transmitted code, it is called
 - (A) Systematic code

(B) CRC

(C) (n,k) cyclic code

- (D) Interleaved code
- c. E1 channel corresponds to
 - (A) 24 8-bit PCM voice channels
 - **(B)** 32 8-bit PCM voice channels
 - (C) 24 16-bit PCM voice channels
 - (D) 32 16-bit PCM voice channels
- d. Aperture effect is associated with
 - (A) Instantaneous sampling
- **(B)** Natural sampling
- (C) Flat-topped sampling.
- (D) Ideal sampling
- e. For an FM system, the effect of decrease in output noise power as the carrier power increases is known as
 - (A) Noise quieting

(B) Threshold

(C) Capture effect

(D) Aperture effect

	f. For tone modulation in AM, the modulation index is 0.3 and the message signal If modulation index is increased from 0.3 to 0.7, the improvement in the output S					
		(A) 3.3 (C) 9.9	(B) 6.6 (D) 12.5			
	g.	A channel described by a channel as a	el matrix with only one non-zero element in each co	lumn is known		
		(A) Deterministic channel(C) Noiseless channel	(B) Loss less channel(D) Noisy channel			
	h. A linear code C of minimum distance d_{min} can correct up to t errors if					
		(A) $d_{min} < t + 1$	(B) $d_{\min} \leq t+1$			
		(C) $d_{min} \ge t+1$	(D) $d_{min} = t + 1$			
	i. Monitoring of the number of telephone calls arriving at a switching center during various in time will most likely correspond to					
		(A) Guassian distribution.	(B) Binomial distribution			
		(C) Rayleigh distribution	(D) Poisson distribution			
		j. A communication channel of t0.1 Mbps using raised cosine pulse	pandwidth 75 kHz is required to transmit binary dates. The roll of factor α is given by	ata at a rate of		
		(A) 1.5	(B) 2.5			
		(C) 5.5	(D) 0.5			
		•	Questions out of EIGHT Questions.			
Q.2	a. Prove that the Dirac Delta function $\delta(t)$ is a limiting form of the Gaussian pulse.			(5)		
		b. Explain how the carrier frequency can be acquired in an AM-DSBSC system using Costas loop. (5)				
	c.	power of 0.5 W. The signal is to amplitude of the carrier to be a	Ily modulated SSB signal $\cos [(\omega_c + \omega_m)t]$ has a be detected by carrier reinsertion technique. Deteinserted so that the power in the recovered start the normalised power. The DC componer	etermine the ignal at the		

Q.3	a. Explain mathematically, how an FM signal can be demodulated using a PLL.(7)				
	 b. An FM signal has a frequency deviation of 5 kHz and a modulating frequenc SNR at the input to the receiving detector is detector output. (5) 	•			
	c. Explain the threshold and the capture effects with reference to FM.	(4)			
Q.4	a. Show that there is an improvement in SNR with companding in a PCM system.	(8)			
	 b. A signal at the input to a μ-law compressor is positive with its voltage one h value. What proportion of the maximum output voltage is produced? Find the maximum for a linear PCM system using 16-bit quantizer. (4) 				
	c. Distinguish between a DS-1 signal and a T1 carrier.	(4)			
Q.5	a. Derive an expression for SNR in a Delta modulated signal.	(6)			
	b. Show that for a fixed bandwidth, the performance of a Delta modulator is in PCM. (4)	nferior to that of			
	c. A signal is to be transmitted using DM and is of the form $s(t)=10 \cos 1000\pi t + 5 \cos 1500\pi t$. Choose an appropriate sampling rate, step size and also find the SNR. (6)				
Q.6	 a. What do you understand by the term ISI in digital communication systems? Exp of reducing ISI. 	lain the methods			
	b. Explain bit and frame synchronization as applied to digital communication systems	s. (6)			
Q.7	a. Derive the radar range equation and discuss the parameters that affect the range?(8)	maximum radar			
	b. Explain a color TV receiver using a block diagram clearly mentioning the furblock.(8)	nctions of every			
Q.8	 a. State and prove Shannon's channel capacity theorem. Derive the Shannon (10) 	's limit (bound).			

b. An FSK system transmits binary data at the rate of 2.5 Mbps. During the course of transmission,

while Guassian noise of zero mean and power spectral density 10^{-20} W/Hz is added to the signal. In the absence of noise, the amplitude of the received sinusoidal wave for digit 1 or 0 is 1 μ V. Determine the average probability of symbol error assuming coherent detection.

- **Q.9** Write explanatory notes on:
 - (i) FM stereophonic broadcasting.
 - (ii) ADM
 - (iii) Optimum Receiver
 - (iv) Block codes

(4x4=16)