

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

- 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 frequency of 1 kHz. The SNR at the input to the receiving detector is 20 dB. Calculate the approximate SNR at the 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 half the maximum value. What proportion of the maximum output voltage is produced? Find the maximum dynamic range 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 inferior to that of PCM. (4)
- 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? Explain the methods of reducing ISI. (10)
- b. Explain bit and frame synchronization as applied to digital communication systems. (6)
- Q.7** a. Derive the radar range equation and discuss the parameters that affect the maximum radar range? (8)
- b. Explain a color TV receiver using a block diagram clearly mentioning the functions of every block. (8)
- Q.8** a. State and prove Shannon's channel capacity theorem. Derive the Shannon's limit (bound). (10)
- b. An FSK system transmits binary data at the rate of 2.5 Mbps. During the course of transmission,

while Gaussian 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 $1 \mu\text{V}$. Determine the average probability of symbol error assuming coherent detection. **(6)**

Q.9 Write explanatory notes on:

- (i) FM stereophonic broadcasting.
- (ii) ADM
- (iii) Optimum Receiver
- (iv) Block codes

(4x4=16)