

**DipIETE – ET (NEW SCHEME)**

Time: 3 Hours

**JUNE 2012**

Max. Marks: 100

**PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.**

**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.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- 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 the best alternative in the following: (2×10)**

a. Shannons-Hartley law states

- (A)  $C=B \log_2 (1+ S/N)^2$                       (B)  $C= B \log_2 (1+ S/N)$   
 (C)  $C= B \log_2 (1- S/N)$                       (D)  $C=B \log( S/N)$

b. The aperture effect in flat top pulses is reduced by using

- (A) Commutator                                      (B) Integrator  
 (C) Equaliser                                        (D) Compander

c. Bandwidth efficiency of a digital multiplexing system is

- (A) less than analog multiplexing system  
 (B) higher than analog multiplexing system  
 (C) equal to analog multiplexing system  
 (D) very poor compare to analog multiplexing system.

d. The noise immunity and cross talk in Manchester PAM format are

- (A) high and low                                      (B) high and high  
 (C) low and low                                        (D) low and high

e. The error rate of BFSK is

- (A) more compare to BPSK                      (B) less compare to BPSK  
 (C) same compare to BPSK                      (D) very low compare to BPSK

f. M-ary transmission means transmitting

- (A) only one bit at a time                      (B) only two bit at a time  
 (C) two or more bit simultaneously            (D) none of the above

- g. Trans mux is an equivalent used to convert
- (A) FDM to TDM (B) TDM to FDM  
(C) Both (A) and (B) (D) None of the above
- h. In model of an additive white Gaussian noise channel, to minimise the average probability of symbol error defined as
- (A)  $P_e = P(m \neq m_i)$  (B)  $P_e = P(m = m_i)$   
(C)  $P_e = 2 P(m \neq m_i)$  (D) none of these
- Where  $m_i$  is the transmitted symbol and  $m$  is estimate produced by vector receiver
- i. A zero source generates two messages with probability 0.8 and 0.2. These are coded as 1 and 0.2. The code efficiency is
- (A) 0.2 (B) 0.5  
(C) 0.7 (D) 1.0
- j. The use of non uniform quantization leads to
- (A) reduction in transmission bandwidth  
(B) increase in max SNR  
(C) increase in SNR for low level signals  
(D) simplification of quantization process

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**Answer any FIVE Questions out of EIGHT Questions.  
Each question carries 16 marks.**

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- Q.2** a. Explain the relation between information rate and entropy. (5)
- b. Explain the procedure for Huffman encoding. (6)
- c. Verify the following expression:  
 $C_s = \log_2 m$  where  $C_s$  is the channel capacity of a lossless channel and  $m$  is the number of symbols in  $X$ . (5)
- Q.3** a. Compare the various sampling techniques on the basis of their methods, noise interference and spectral properties. (8)
- b. A continuous-time signal is given below:  
 $X(t) = 8 \cos 200 \pi t$ , Determine:
- (i) Minimum sampling rate required to avoid aliasing  
(ii) If sampling frequency  $f_s = 400$  Hz. What is the discrete-time signal  $x[n]$  or  $x[nT_s]$  obtained after sampling?

- (iii) If sampling frequency  $f_s = 150$  Hz. What is the discrete-time signal  $x[n]$  or  $x[nT_s]$  obtained after sampling
- (iv) What is the frequency  $0 < f < f_s / 2$  of sinusoidal that yields samples identical to those obtained (8)
- Q.4** a. Explain Adaptive delta modulation with the help of neat diagram and list its advantages. (8)
- b. An audio signal consisting of the sinusoidal term given as:  
 $x(t) = 3 \cos(500\pi t)$
- (i) Determine the signal to quantization noise ratio when this is quantized using 10 bit PCM.
- (ii) How many bits of quantization are needed to achieve a signal to quantization noise ratio of at least 40 dB? (8)
- Q.5** a. Draw the block diagram showing the element of base band binary PAM systems. (6)
- b. The binary data 1101010110 is transmitted over a base band channel. Draw the waveform for transmitted data using following format
- (i) Unipolar NRZ (ii) Polar RZ  
(iii) Split phase Manchester format (iv) Polar quaternary NRZ signalling. (10)
- Q.6** a. Explain the principle of Quadriphase-shift keying. (8)
- b. What are the advantages and disadvantages of MSK as compared to QPSK? (8)
- Q.7** a. Define matched filter. Calculate impulse response for the matched filter. (10)
- b. Explain the Principal of correlation receiver. (6)
- Q.8** a. Explain the application of code-division Multiple Access in spread spectrum modulation. (8)
- b. Draw and analyse the model of direct-sequence spread binary PSK system. (8)
- Q.9** Write Short note on any **TWO** of the following:
- (i) Frequency HOP spreading  
(ii) Application of waveform coding techniques  
(iii) Eye pattern (2×8)