Reg. No. :

Question Paper Code : 52446

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fifth Semester
Electronics and Communication Engineering
EC 2301 – DIGITAL COMMUNICATION
(Regulations 2008)
(Common to PTEC 2301 – Digital Communication for B.E. (Part-Time) Fourth Semester – ECE – Regulations 2009)

Time : Three Hours Maximum : 100 Marks

PART – A (10×2=20 Marks)

1. Define bounded power spectral density.
2. Give examples of two practical channels which are linear time-variant filter channels.
3. If random signal has frequency components in the range 10 Hz to 40 kHz. Find the minimum sampling rate that could be applied over the signal.
4. A delta modulator is fed by the message signal $f(t) = 6 \sin 2\pi\ (10)\, t + 4 \sin 2\pi\ (20) t$. Find the minimum sampling frequency required to prevent slope overload, assuming that the stepsize of the modulator is 0.1π.
5. Find the hamming distance between 0101 and 1010.
6. The RS 232 serial port on a system transmits 2.4 kbps data using a bipolar NRZ line code with a peak value of 12 V. Assuming that binary 1's and 0's are equally likely to occur, find the psd of the signal.
7. A 64 kbps binary PCM polar NRZ signal is passed through a communication system with a raised-cosine filter with roll-off factor 0.25. Find the bandwidth of the filtered PCM signal.
8. State any four applications of eye diagram.
9. Draw the signal space diagram of a QPSK system.
10. What is a coherent receiver ?

PART – B (5×16=80 Marks)

11. a) i) Draw the block diagram of a typical digital communication system and explain each block. (14)

ii) A digital source can produce M = 256 distinct messages. Each message is transmitted in $T_0 = 8$ msec. Find the bandwidth of the transmitted binary signal if sinc pulses are used for transmission. (2)

(OR)

b) i) A random variable Z is uniformly distributed in the range p to q. Find the mean and variance of the random variable. (6)

ii) A random variable θ has a uniform pdf in the range $0 \leq \theta \leq 2\pi$. Find the pdf of the random variable $X = \text{Sin}\ \theta$. Find the expectation of X. (10)

12. a) i) A signal m(t) is uniformly distributed in the range $\pm V_p$. The signal is quantised by a uniform quantiser. Find the ratio of the peak SNR to the average SNR of the quantised signal. (9)

ii) With a neat block diagram, explain adaptive delta modulation system. (7)

(OR)

b) i) Derive the expression for SNR of a DM system. Comment on the expression. (12)

ii) Write notes on linear predictive coding. (4)

13. a) i) For a (7, 4) code, the generator matrix is given below. The received word is 100011. Find the transmitted information word.

$$[G] = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$ (9)

ii) State and derive the expression for the normalised PSD of a rectangular Bipolar NRZ signal. (7)

(OR)

b) Explain viterbi algorithm with a suitable example. (16)

14. a) i) A binary baseband digital communication system uses the signal

$$s(t)=\begin{cases}\dfrac{1}{\sqrt{Ts}}, & 0\le t\le Ts\\ 0 & \text{elsewhere}\end{cases}$$

Find the outputs if the signal is passed through

a) Matched filter.

b) Correlator. (9)

ii) Explain the purpose and working of early-late gate synchroniser. (7)

(OR)

b) Explain Nyquist first criterion for zero ISI realisation.

15. a) Draw an optimum binary DPSK demodulator. Derive the expression for bit error probability of a DPSK receiver. (16)

(OR)

b) State and compare the spectral characteristics of ASK, PSK, QPSK and FSK signals. (16)
