Reg. No. :

Question Paper Code : X65651

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Sixth Semester
Electronics and Communication Engineering
080290039 – DIGITAL COMMUNICATION
(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. State sampling theorem.
2. Define quantitation noise.
3. List out the characteristics of discrete PAM signals.
4. What is the need for adaptive equalization for data transmission ?
5. A certain telephone line band width is 3.5 KHz. Calculate the data rate (in b/s) that can be transmitted, if we use binary signaling with the raisedcosine pulses and the roll-off factor $\alpha = 0.25$.
6. What is a Matched Filter ?
7. Define linear block code.
8. What is meant by constraint length of a convolutional code ?
9. A PN sequence generator makes use of eight shift registers and has a chip rate of 10 MHz. Find the chip duration.
10. What are the classifications of frequency hop spread spectrum ?

PART – B **(5×16=80 Marks)**

11. a) i) Compare PCM, DPCM and DM. **(5)**

ii) Explain the process of Delta Modulation and the methods to avoid different types of noises. **(5)**

iii) Show that if the sampling rate is equal to or greater than twice the highest message frequency, the message m(t) can be recovered from the natural sampled signal $X_{ns}(t)$ by low-pass filtering. **(6)**

(OR)

b) i) Explain the modulation and demodulation processes of pulse code modulation with necessary diagrams and expressions. **(10)**

ii) Given the signal

$m(t) = 10 \cos 2000 \pi t \cos 8000 \pi t$.

1) What is the minimum sampling rate based on the low-pass uniform sampling theorem ? **(3)**

2) Repeat (1) based on the band pass sampling theorem. **(3)**

12. a) Explain the Nyquist's criteria for distortion less baseband binary transmission both in time domain and frequency domain representation in detail. **(16)**

(OR)

b) i) Explain how the Raised cosine spectrum overcomes the two difficulties of the ideal Nyquist channel ? **(8)**

ii) Explain the adaptive equalization for data transmission. **(8)**

13. a) Consider a signal of the form $s(t,a) = \begin{cases} as(t) & 0 \le t \le T \\ 0 & \text{elsewhere} \end{cases}$ where s(t) is completely known and the amplitude 'a' is unknown. Find the maximum likelihood estimate of 'a' in the presence of white Gaussian noise of zero mean and power spectral density $\frac{No}{2}$. What are the mean and variance of this estimate ?

(OR)

b) i) What do you mean by QPSK system ? Define the symbols and construct the signal space diagram. **(4)**

ii) With detailed block diagrams, explain the functions of each block in the transmitter and receiver of QPSK system. **(6)**

iii) Derive probability of error of QPSK system. **(3)**

iv) Compare QPSK with QAM. **(3)**

14. a) Consider a linear block code with generator matrix.

$$G = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

i) Determine the parity check matrix.

ii) Determine the error detecting and capability of the code.

iii) Draw the encoder and syndrome calculation circuits.

iv) Calculate the syndrome for the received vector r = [1 1 0 1 0 1 0]. **(2+4+6+4)**

(OR)

b) i) The generator polynomial of a (7, 4) cyclic code is $1 + X + X^3$. Develop encoder and syndrome calculator for this code. **(8)**

ii) Explain Viterbi decoding algorithm for convolutional code. **(8)**

15. a) With an appropriate example, explain the concept and working of frequency hopping spread spectrum communication systems. Give necessary equations.

(OR)

b) Explain the following with reference to spread spectrum system.

i) m- sequence and gold sequence **(8)**

ii) PN sequences **(4)**

iii) Anti jamming. **(4)**
