PAPER ID-420394

Subject Code: KEC601

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2021-22
DIGITAL COMMUNICATION

Time: 3 Hours ***Total Marks: 100***

Notes:

- *Attempt all Sections and Assume any missing data.*
- *Appropriate marks are allotted to each question, answer accordingly.*

SECTION-A	Attempt **All** of the following Questions in brief	Marks **(10X2=20)**	**CO**
Q1(a)	A die is thrown. Determine the probability that an even number comes up.		1
Q1(b)	Define random variable.		1
Q1(c)	Briefly explain inter symbol interference.		2
Q1(d)	Draw waveform for NRZ- unipolar code for 101101.		2
Q1(e)	For an ideal binary ASK, data is transmitted with 64kbps, find the bandwidth.		3
Q1(f)	Discuss the application of ASK modulation.		3
Q1(g)	Briefly explain any one property of a matched filter.		4
Q1(h)	Define bit error rate.		4
Q1(i)	Briefly explain information.		5
Q1(j)	Find the entropy for three messages with their probabilities ½, ¼ and 1/4 respectively.		5

SECTION-B	Attempt **ANY THREE** of the following Questions	Marks **(3X10=30)**	**CO**
Q2(a)	The probability density function is given as $f_x(x) = ae^{-b\|x\|}$, where X is a random variable, whose allowable values range from $x = -\infty$ to $x = +\infty$. Find: i) Relationship between a and b ii) Autocorrelation		1
Q2(b)	Write Short Notes on any two of the following: i) Various NRZ line coding of data 11001101 ii) Eye diagram iii) Gram-Schmidt orthogonalization procedure		2
Q2(c)	Explain the PSK modulation and demodulation with suitable block diagram and waveforms. Compare the BPSK system with DPSK system.		3
Q2(d)	Describe matched filter with suitable diagram? Prove that impulse response of a matched filter is proportional to a shifted version of the input signal to which filter is matched?		4
Q2(e)	Define entropy and mutual information? Prove the relationship between different entropies H(XY) = H(X/Y) + H(Y)		5

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	**CO**
Q3(a)	Differentiate between wide sense stationary and strict sense stationary random processes? Find the mean and variance of the sum of two random variables if the mean of one of the two random variables is zero. Assume the random variables as per convenience.		1
Q3(b)	Discuss Gaussian random process with central limit theorem along with a suitable example and diagram.		1

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SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	CO
Q4(a)	Explain the function of scrambler and descrambler with neat block diagram. Give an example with a sequence generated.		2
Q4(b)	Draw and explain function of each block in digital communication system. Also state the need of pulse shaping.		2

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	CO
Q5(a)	How does the QPSK modulator transmit digital data over channel? Also explain the demodulation process of the QPSK modulated signal from an ideal channel.		3
Q5(b)	Explain QAM system with suitable block diagram and constellation diagram.		3

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	CO
Q6(a)	Derive the expression for probability of error in FSK modulation system. Mention all the assumed parameters clearly. Why is it better than ASK?		4
Q6(b)	Describe the spread spectrum modulation with FHSS and DSSS.		4

SECTION-C	Attempt **ANY ONE** following Question	Marks **(1X10=10)**	CO
Q7(a)	The parity check matrix of a particular (7,4) linear block code is given by: $$[H]=\left[\begin{array}{cccc:ccc} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{array}\right]$$ i) Find the generator matrix (G). ii) List all the code vectors. iii) What is the minimum distance between code vectors?		5
Q7(b)	Construct Huffman codes for five messages m_1, m_2, m_3, m_4 and m_5 with probabilities 0.0625,0.125,0.25, 0.0625 and 0.5, respectively. Calculate the entropy and average length of the code. Also explain the procedure for finding the code.		5