

University of Mumbai
Examination First Half 2022

Examinations Commencing from 17th May 2022 to 15th June 2022

Program: Electronics and Telecommunication Engg.

Curriculum Scheme: Rev2019

Examination: TE Semester V

Paper Code 32221 Course Code: ECC 501 and Course Name: Digital Communication

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Entropy is maximum when
Option A:	Symbols with equal probability
Option B:	Symbols with unequal probability
Option C:	Less no. of symbols
Option D:	None of the above
2.	For a (6, 3) block code, 6 is the ----- and 3 is the number of redundant bits
Option A:	Information bits
Option B:	Redundant bits
Option C:	Information rate
Option D:	Total number of bits
3.	If a source generates symbols with the rate of 500 symbols/sec and entropy of the source is 5 bits/symbol, the information rate will be
Option A:	1520bps
Option B:	1220bps
Option C:	1250 bps
Option D:	2000bps
4.	If SNR is 20dB and channel BW is 2.4 Khz, the channel capacity will be
Option A:	16 kbps

Option B:	20 kbps
Option C:	32 kbps
Option D:	40 kbps
5.	BW requirement for QPSK is
Option A:	Fb
Option B:	Fb/2
Option C:	4fb
Option D:	2fb
6.	For M equally likely messages, the average amount of information H is
Option A:	$H = 2\log_2 M$
Option B:	$H = 10\log_{10} M$
Option C:	$H = 2\log_{10} M$
Option D:	$H = \log_2 M$
7.	The Euclidean distance for QPSK is
Option A:	$\sqrt{2Eb}$
Option B:	$\sqrt{1.5Eb}$
Option C:	\sqrt{Eb}
Option D:	$2\sqrt{Eb}$
8.	In a digital communication system, the input data rate is 1Mbps and carrier frequency is 500khz, BW required for 16 PSK system is
Option A:	1 Mbps
Option B:	1.5 Mbps
Option C:	2 Mbps
Option D:	0.5 Mbps
9.	In (n, k) linear block code, the parity bits are defined as $m = n - k$, the number of message bits are

Option A:	$k = 2^m - 1 - m$
Option B:	$k = 2^n - 1 - m$
Option C:	$k = 2^m - 1 - n$
Option D:	$k = n - 1 - m$
10.	ISI can be reduced by
Option A:	Differential coding
Option B:	Polar NRZ
Option C:	Manchester coding
Option D:	Unipolar RZ

Q2	
A	Solve any Two 5 marks each
i.	Explain coherent and non-coherent detection.
ii.	Define code rate, code efficiency, systematic and non-systematic code in context with linear block code.
iii.	Why is MSK called shaped QPSK?
B	Solve any One 10 marks each
i.	Explain working of 16-ary PSK transmitter and receiver and plot spectrum and calculate BW.
ii.	What is an eye diagram? With the help of a suitable diagram explain the parameters observed from the diagram.

Q3	
A	Solve any Two 5 marks each
i.	Define entropy and when entropy is maximum.
ii.	Explain characteristics of line codes.
iii.	Compare OQPSK and non-OQPSK.
B	Solve any One 10 mark each
i.	A DMS generates symbols A(0.4), B(0.2), C(0.1), D(0.1), E(0.1), F(0.1) Calculate Entropy of the source, obtain Huffman code and its code efficiency.
ii	Explain OQPSK transmitter with block diagram and draw the modulated output waveform for the given input sequence $b(t) = 1001110$

Q4.	
A	Solve any Two 5 marks each
i.	Compare FEC and ARQ system
ii.	Justify that the probability of error in a matched filter does not depend on the shape of the input signal.
iii.	Explain soft decision and hard decision decoding.
B	Solve any One 10 marks each
i.	<p>The parity check bits of a (8,4) block codes are generated by</p> $C_5 = d_1 + d_2 + d_4$ $C_6 = d_1 + d_2 + d_3$ $C_7 = d_1 + d_3 + d_4$ $C_8 = d_2 + d_3 + d_4$ <p>Where d_1, d_2, d_3, d_4 are message bits.</p> <p>Find (1) Generator matrix and Parity check matrix (2) Minimum weight of the code (3) Obtain code vector for message bits (1) 1100 and (2) 1001</p>
ii.	Explain Viterbi decoding algorithm for convolutional code..