GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
COMMUNICATION ENGINEERING AND CODING THEORY
IT404

TIME ALLOTTED: 3 HOURS   FULL MARKS: 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)
Answer any *ten* from the following, choosing the correct alternative of each question: 10×1=10

			Marks	CO No
1.	(i)	Asynchronous detection in AM system is done by a) Balanced Modulator b) PLL c) Envelop Detector d) Foster Seelay Detector	1	CO1
	(ii)	In uniform quantization process a) The step size remains same b) Step size varies according to the values of the input c) The Quantizer has linear characteristics d) Both a and c are correct	1	CO2
	(iii)	In Delta Modulation, the bit rate is a) N times the sampling frequency b) N times the modulating frequency c) N times the nyquist criteria d) None of the above	1	CO2
	(iv)	The expression for bandwidth BW of a PCM system, where v is the number of bits per sample and fm is the modulating frequency, is given by a) $BW \geq vfm$ b) $BW \leq vfm$ c) $BW \geq 2\,vfm$ d) $BW \geq 1/2\,vfm$	1	CO2
	(v)	Coherent detection of binary ASK signal requires a) Phase synchronization b) Timing synchronization c) Amplitude synchronization d) Both a and b	1	CO3

(vi) In Binary FSK, mark and space respectively represent 1   CO4
a) 1 and 0
b) 0 and 1
c) 11 and 00
d) 00 and 11

(vii) The channel capacity is 1   CO5

a) The maximum information transmitted by one symbol over the channel
b) Information contained in a signal
c) The amplitude of the modulated signal
d) All of the above

(viii) For M equally likely messages, M>>1, if the rate of information R > C, the 1   CO5
probability of error is
a) Arbitrarily small
b) Close to unity
c) Not predictable
d) Unknown

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probability of error is
a) Arbitrarily small
b) Close to unity
c) Not predictable
d) Unknown

(x) The data rate of QPSK is _____ of BPSK. 1   CO3

a) Thrice
b) Four times
c) Twice
d) Same

(xi) Phase modulated signal is generated from Frequency modulator with addition 1   CO1
of ------------

a) Integrator
b) Differentiator
c) Adder
d) Comparator

(xii) Eye pattern is used to study 1   CO2
a) Bit error rate
b) Error vector magnitude
c) Quantization noise
d) Inter Symbol Interference

GROUP – B
(Short Answer Type Questions)
Answer any *three* from the following: 3×5=15

			Marks	CO No
2.		Explain the operation of Envelop Detector used in Amplitude Modulation.	5	CO1
3.	(a)	What is Companding?	1	CO2
	(b)	To transmit a bit sequence 10011011, draw the resulting waveform using unipolar RZ Polar NRZ Bipolar/AMI RZ Split phase Manchester coding	4	CO2
4.	(a)	Draw ASK, FSK, PSK signals to transmit data stream 1111000111.	4	CO3
	(b)	Relate the amount of information provided and probability of occurrence of events.	1	CO5
5.		A discrete source emits one of five symbols once every milliseconds with probabilities 1/2, 1/4, 1/8, 1/16 and 1/16. Find the source entropy and information rate. State and explain Shannon Hartley theorem.	5	CO5
6.		State and explain sampling theorem for band-limited signals. State Carson's Rule of Frequency Modulation.	5	CO2, CO1

GROUP – C
(Long Answer Type Questions)
Answer any *three* from the following: 3×15=45

			Marks	CO No
7.	(a)	Explain with a suitable block diagram how an analog signal is converted into a digital signal using PCM	8	CO2
	(b)	With neat block diagram, explain the generation & reception of Delta Modulation (DM)	7	CO2
8.	(a)	Construct the Huffman code with minimum code variance for the following probabilities and also determine code efficiency: {0.25, 0.25, 0.125, 0.125, 0.125, 0.0625, 0.0625}	10	CO5
	(b)	Find the discrete entropy for the source with symbol probabilities {0.3, 0.25, 0.2, 0.15, 0.1}	5	CO5
9.	(a)	Compare DSB-SC and AM-FC modulation techniques	3	CO1
	(b)	Explain the quadrature null effect in SSB-SC modulation. How can be it eliminated?	2	CO1
	(c)	Draw the signal space representation of orthogonal BFSK and find the distance between symbols.	5	CO4
	(d)	A Memory less source emits six messages with probabilities {0.1, 0.4, 0.4, 0.2, 0.2}. Find the Shannon - Fano code and determine its efficiency.	5	CO5
10.	(a)	What do you mean by DPCM? What is the function of anti-aliasing filter for the generation of PAM signal? What is the slope overload distortion and granular noise in delta-modulation?	7	CO2
	(b)	With neat block diagram. Explain the generation & detection of the BFSK signal.	8	CO5
11.		Write short notes on any three of the followings:	3x5=15	
	(a)	VSB-SC Modulation	5	CO1
	(b)	Eye pattern	5	CO2
	(c)	Regenerative repeater	5	CO2
	(d)	ARQ	5	CO5