GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2021
ADVANCED COMMUNICATION SYSTEMS
EC801

TIME ALLOTTED: 3 Hrs **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)	Which two channels are responsible for initiating mobile calls? a) FVC and FCC b) FVC and RVC c) FCC and RCC d) FCC and RVC	1	CO3
	ii)	Which of the following is not a statistical model for multipath fading channels? a) Clarke's model for flat fading b) Saleh and Valenzuela indoor statistical model c) Two ray Rayleigh fading model d) Faraday model	1	CO4
	iii)	Power delay profile is represented as plots of ..... with respect to fixed time delay reference. a) Relative received power b) Frequency c) Transmit power d) Relative power	1	CO3
	iv)	A satellite signal transmitted from a satellite transponder to earth's station is called a) Uplink b) Downlink c) Terrestrial d) Earthbound	1	CO1
	v)	The distribution of shadow fading (linear scale) is, a) Normal b) Lognormal c) Uniform d) Rician	1	CO2

vi)	The period of a PN sequence produced by a linear m stage shift register cannot exceed _____ symbols. a) 2m b) m c) 2^m d) $2^m - 1$	1	CO3
vii)	In wireless ad-hoc network _____ a) access point is not required b) access point is must c) nodes are not required d) all nodes are access points	1	CO4
viii)	Which property of OFDMA system allows adjacent subcarriers to be used without interference? a) Orthogonality b) Orthodoxy c) Octagonality d) Originality	1	CO3
ix)	The transmitter-receiver combination in the satellite is known as a _____ a) Relay b) Repeater c) Transponder d) Duplexer	1	CO5
x)	Which one of the following enables us to use the entire bandwidth simultaneously? a) FDMA b) TDMA c) CDMA d) All of the above	1	CO3
xi)	In a Cellular network, which of the following is used to use the same frequency for others? a) Frequency hopping b) Frequency reuse c) Frequency planning d) None of the above	1	CO5
xii)	Which of the following is the ratio of signal energy per bit to noise power spectral density? a) Bandwidth efficiency b) Spectral density c) Power efficiency d) Power density	1	CO1

GROUP – B
(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

			Marks	CO No.
2.	a	The PDF of amplitude X of a certain signal $x(t)$ is given by $f_X(x) = 0.5\|x\|e^{-\|x\|}$ Determine: $F(X \geq 1)$	3	CO1
	b	Derive the relationship between CDF and PDF.	2	CO1
3.		Explain the fading effects due to multipath time delays spread and fading effects due to Doppler spread.	5	CO3
4.		What is the difference, or are the differences, between a geosynchronous satellite and a geostationary satellite orbit?	5	CO2
5.		Find the probability of symbol error for the MQAM system.	5	CO2
6.	a)	State the difference between Cellular Network and Ad Hoc Wireless Network.	3	CO5
	b)	What are the characteristics and features of wireless sensor networks?	2	CO3

GROUP – C
(Long Answer Type Questions)

(Answer any *three* of the following) **3 x 15 = 45**

			Marks	CO No.
7.	a)	What is meant by small scale fading? List out the factors influencing small-scale fading	5	CO3
	b)	Explain about free space propagation model? What is Doppler shift?	5	CO2
	c)	With necessary diagrams explain the technique spectrum "Hand off" in cellular network.	5	CO2
8.	a)	State and explain Kepler's law of planetary motion.	5	CO5
	b)	With the help of a block diagram briefly explain satellite transponder subsystem.	5	CO1
	c)	A satellite is in an elliptical orbit with a perigee of 1000 km and an apogee of 4000 km. Using a mean earth radius of 6378.14 km, find the period of the orbit in hours, minutes, and seconds, and the eccentricity of the orbit.	5	CO2
9.	a)	Derive the relation between SNR per bit and SNR per symbol considering AWGN channel.	3	CO5
	b)	Find out the probability of symbol error for QPSK using the probability of bit error for BPSK.	7	CO4

	c)	Find the bit error probability P_b and symbol error probability P_s of QPSK assuming γ_b = 7 dB. Compare the exact P_b with the approximation $P_b \approx P_s/2$ based on the assumption of Gray encoding. Finally, compute P_s based on the nearest neighbor bound using $\gamma_s = 2\gamma_b$ and then compare with the exact P_s.	5	CO5
10.	a)	Give the advantages associated with spreading a signal spectrum.	2	CO3
	b)	What are the differences between Slow and Fast Frequency Hopping?	3	
	c)	Draw the block diagram of DS-SS transmitter with binary phase modulation and explain its operation	5	CO2
	d)	Draw the block diagram of RAKE receiver and explain the operation	5	CO2
11.		Write short notes on any ***three*** of the following:	3x5=15	
	a)	Outage Probability	5	CO4
	b)	Coherence Bandwidth	5	CO1
	c)	Look Angle Determination	5	CO2
	d)	Frequency hopped spread spectrum signals	5	CO3
	e)	CDMA	5	CO5