Reg. No.															

B.Tech. DEGREE EXAMINATION, JULY 2024

Seventh Semester

18ECC301T - WIRELESS COMMUNICATION

(For the candidates admitted from the academic year 2021 - 2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART - A (20 x 1 = 20 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
1.	Advanved Mobile Phone System is a _____ standard. A) Packet switching B) 1st Generation cellular C) European Cellular D) Digital cellular	1	1	1	1
2.	Imperfect receiver filters leads to _____. A) Co-channel interference B) Adjacent channel interference C) Intersymbol interference D) Nil interference	1	2	1	4
3.	Cell splitting _____ co-channel reuse factor. A) Decreases exponentially B) Increases exponentially C) Decreases linearly D) Doesn't change	1	3	1	4
4.	Assume each user of a single base station mobile radio system averages six calls per hour, each call lasting on average of 6 minutes. What will be the traffic intensity of each user? A) 3.6 Erlang B) 2.5 Erlang C) 0.6 Erlang D) 0.25 Erlang	1	2	1	1
5.	Express the transmit power of 1 mW in dBm. A) -60 B) -30 C) 0 D) 30	1	2	2	2
6.	Calculate the Brewster angle,for a wave with 900 MHz operating frequency impinging on ground having a relative permittivity of 3. A) 60 B) 30 C) 10 D) 27	1	3	2	4
7.	An antenna with maximum dimension of 1.5 m is operating at a frequency of 1800 MHz. Calculate the Fraunhofer distance in meter. A) 5.33 B) 6 C) 12 D) 27	1	3	2	4
8.	Which distribution describes the shadowing effect? A) Rayleigh B) Nakagami C) Ricean D) Log Normal	1	2	2	4
9.	Doppler frequency shift leads to _____. A) Frequency selective fading B) Time dispersive distortion C) Time selective Fading D) Flat fading	1	3	3	2

10. The fast fading occurs when the coherence time of the channel is _____ of transmitted signal. 1 3 3 2

A) Greater than symbol period B) Lesser than symbol period
C) Greater than bandwidth D) Lesser than bandwidth

11. The mean value of received envelope in Rayleigh distribution is _____ time(s) of the rms value. 1 3 3 2

A) 1.177 B) 1.253
C) 0.429 D) 1

12. Consider a mobile user moving directly towards the base station with a velocity of 60 Kmph at carrier frequency 900 MHz. Calculate the Doppler shift in the carrier frequency. 1 2 3 3

A) 0 Hz B) 15 Hz
C) 45 Hz D) 51 Hz

13. Which of the following is true regarding Channel State Information (CSI) in a TDD system? 1 2 4 7

A) Can not be estimated by receiver B) Can be estimated by tranmitter
C) Can not be estimated by transmitter D) Needs to be fedback from receiver

14. Rake receiver makes use of _____ diversity. 1 1 4 7

A) Spatial B) Frequency
C) Time D) pattern

15. In MIMO, which factor has the greatest influence on data rates? 1 2 3 2

A) Number of transmit antennas B) Number of receive antennas
C) Size of Antennas D) Height of the antennas

16. Equalization is used to minimize _____. 1 1 4 2

A) Noise B) Intersymbol interference
C) Intercarrier interference D) Peak to Average Power ratio

17. GSM frame period is 4.615 ms. Find its bit period in microsec. 1 3 5 3

A) 576.9 B) 270.833
C) 13.4 D) 3.692

18. In IS-95 the forward and reverse channel pair is separated by _____. 1 1 5 6

A) 1.25 MHz B) 20 MHz
C) 45 MHz D) 50 MHz

19. Cyclic prefix is used in OFDM to reduce _____. 1 2 5 3

A) PAPR B) ISI
C) ICI D) MAI

20. Which of the following is not working in ISM band? 1 1 5 6

A) LTE B) WiFi
C) Bluetooth D) ZigBee

PART - B (5 x 4 = 20 Marks) Marks BL CO PO
Answer **ANY FIVE** Questions

21 What is blocked call delayed system? Give the Erlang C formula. 4 2 1 4

22 Highlight the pros and cons of Dynamic Channel Assignment. 4 3 1 4

23 Briefly discuss about the three radio wave propagation mechanisms. 4 2 2 4

24	Derive the path length difference for two ray ground reflection model in terms of antenna height and separation.	4	4		
25	Analyze the various factors influencing small scale fading.	4	3	3	
26	Consider a wireless channel with bandwidth of 30 KHz and AWGN with noise power spectral density $N_0/2$, where N_0 is 10^{-9} W/Hz. For a transmit power of 1 W, find the received SNR for a transmit–receive distance of 1 Km and the capacity of the time-invariant channel. (Use close-in refence point at 10m).	4	3	4	2
27	List the advantages and disadvantages of OFDM.	4	2	5	3

PART - C (5 x 12 = 60 Marks)
Answer **ALL** the Questions

		Marks	BL	CO	PO
28 a.	Elabrorate three techniques to improve capacity in Cellular system with neat diagrams.	12	3	1	4
	(OR)				
b.	If a signal to interference ratio of 18 dB is required for satisfactory performance of a FDMA/FDD cellular system, what is the frequency reuse cluster size that should be used for maximum capacity if the path loss exponent is n = 4? (Assume that there are 6 equi-distance co-channels cells in the first tier and suitable approximations). If the total bandwidth is 30 MHz and simplex subchannel bandwidth is 25 kHz, compute the number of subchannels available per cell. If 1 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell.	12	3	1	4
29 a.	i) Explain free space propagation model with Friis equation and suitable expression for received power and path loss in dB with reference to small close-in distance. (8 Marks) ii) If 50 watts input is applied to a unity gain transmit antenna with a 900 MHz carrier frequency, find the received power in dB at a free space distance of 1 Km from the antenna. Assume unity gain for the receiver antenna also. (4 Marks)	12	3	2	4
	(OR)				
b.	i) Describe the Okumura outdoor propagation model with relevant equations. (8 Marks) ii) Calculate the total mean path loss using Okumura's model for d = 50 km, hte = 100 m, hre = 10 m in a suburban environment. If the base station transmitter radiates an EIRP of 1 KW at a carrier frequency of 900 MHz. [Use: Meadian attenuation of 43 dB and Area correction factor of 9 dB]. (4 Marks)	12	3	2	4
30 a.	i) Discuss the impulse response model of mobile multipath radio channel and obtain the expression for the received power delay profile. (8 Marks) ii) Consider a 3 component multipath wireless channel with components arriving at 0μs, 1μs, and 2μs with respective powers values as -10 dB, 0 dB and -20 dB respectively. Calculate the rms delay spread and 50% correlation coherence bandwith. (4 Marks)	12	3	3	3
	(OR)				
b.	i) With neat diagram explain the spread spectrum sliding correlator channel sounding technique. Also discuss about its pros and cons. ((6+4) Marks) ii) Calculate the coherence time, if time correlation function is above 0.5 for a frequency of 1900 MHz and velocity of 50 m/s. (2 Marks)	12	3	3	3
31 a.	i) Explain the working of RAKE receiver in CDMA systems with a neat block diagram. (6 Marks) ii) Give the taxonomy of equalizer. Also draw the structure of Linear Adaptive Equalizer. (6 Marks)	12	3	4	
	(OR)				

b.i) Derive an expression for capacity of the flat fading channel and its outage when the CSI is known only at receiver. Compare it with that of a time invariant channel. (8 Marks)

ii) Briefly explain the scan and switch combining technique with neat diagram. (4 Marks)

32 a. Discuss about the functions of GSM sub-systems with neat system architecture. Also give its interface details and other specifications.

(OR)

b. Explain the working of OFDM transmitter and receiver with neat block diagrams

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