Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth Semester B.Tech Degree Supplementary Examination October 2023 (2019 Scheme)

Course Code: ECT402
Course Name: WIRELESS COMMUNICATION

Max. Marks: 100 **Duration: 3 Hours**

PART A
Answer all questions, each carries 3 marks. Marks

1	Compare and contrast the analog and digital cellular systems	(3)
2	What are the methods adopted for hand-off procedures?	(3)
3	How does fading occur? Derive the expression for doppler shift.	(3)
4	Assume a receiver is located 10km away from a 50W transmitter. Given $f = 900$ MHz, $G_t = 1$ and $G_r = 2$. Find the power at receiver and RMS voltage at receiver antenna matched with 50 Ω resistor.	(3)
5	How is the outage probability computed for a wireless channel?	(3)
6	Explain the significance of using cyclic prefix in an OFDM system	(3)
7	Differentiate between microdiversity and macrodiversity.	(3)
8	Compare pros and cons of linear equaliser over non-linear equaliser.	(3)
9	Deduce the expression for critical frequency of an ionised region in terms of its maximum ionization density.	(3)
10	Explain the mechanism of wave bending in ionosphere with suitable diagram.	(3)

PART B
Answer any one full question from each module, each carries 14 marks.

Module I

11 a) Describe the features of the GSM system architecture with the help of a neat block diagram. (07)

    b) How does cell splitting and sectoring improve the capacity and coverage of the cellular system. (07)

OR

12 a) Explain the different channel assignment strategies used in cellular system. (07)

    b) Enumerate the features of 4G wireless network. (07)

Module II

13 a) Consider a wireless channel, where power falloff with distance follows the formula $P_r(d) = P_t(d_0/d)^3$ for $d_0 = 50m$. Assume the channel has bandwidth B =50KHz and AWGN with noise PSD $N_0/2$, Where $N_0 = 10^{-9}$ W/Hz. For a transmit power of 2W, find the capacity of this channel for a receive transmit distance of 200m and 1KM? What is your conclusion? (07)

b) Derive the expression for the impulse response model of a multipath channel (07)

OR

14 a) What is the received power in dBm for a free space signal. whose transmit power is 1W and carrier frequency is 2.4GHz. If the receiver is at a distance of 1 mile (1.6 km) from the transmitter. What is the path loss in dB? (07)

b) What is inferred by the channel capacity of AWGN channel? (04)

c) What is meant by time selective Fading? (03)

Module III

15 a) With the help of mathematical equations show how linear convolution is converted to circular convolution in OFDM using Cyclic prefix. (07)

b) Determine the average SNR per bit of BPSK modulation in Rayleigh slow fading channel in such that 90% of the times , the average probability of bit error is less than 10^{-4}. (07)

OR

16 a) How can the subcarrier fading be mitigated in multicarrier modulation system? (07)

b) Explain the techniques employed to reduce PAPR in OFDM . (07)

Module IV

17 a) Describe the working principle of a Zero Forcing Equaliser with the help of a neat diagram. (07)

b) Derive the expression for received SNR of transmitter diversity with 2 X 2 Alamouti scheme . (07)

OR

18 a) Describe the steps to compute tap weights iteratively in LMS algorithm? . (07)

b) Compare and contrast any three types of multiple access methods adopted in wireless communication system . (07)

Module V

19 a) A television transmitter antenna mounted at a height of 200 meters and the receiving antenna has a height of 20 meters. What is the maximum spacing between the transmitter and receiver through tropospheric propagation? Also compute the radio horizon in this case. (07)

b) Derive expression for critical frequency , maximum usable frequency and skip distance (assume flat earth's surface) for skywave propagation . (07)

OR

20 a) List out the features of the various modes of radio wave propagation. (08)

b) What is the critical frequency for reflection at vertical incidence if the maximum value of electron density is 1.24x 10^8 electrons/cc? (06)

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