Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Eighth Semester B.Tech Degree Regular Examination June 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 Define Grade Of Service (GOS) and Trunking. (03)

2 What are the standards used for implementing Wireless Personnel Area Network (WPAN)? (03)

3 Find the Fraunhofer distance for an antenna with maximum dimension of one meter and operating frequency of 900MHz. What is the significance of Fraunhofer distance? (03)

4 What is meant by coherence bandwidth of the channel? Define coherence bandwidth in terms of rms delay spread of the channel. (03)

5 What is the total bandwidth required for multi carrier modulation implementation with non-overlapping subchannels? (03)

6 What is Peak-to-Average Power-Ratio (PAPR) in OFDM system? How can it be reduced? (03)

7 Define Outage Probability ($P_{out}$) of a wireless channel. (03)

8 Compare and contrast linear equalizer over non – linear equalizer. (03)

9 What do you mean by virtual height of an ionospheric layer? (03)

10 Which mode of propagation is used by radio waves of frequency above 300MHz? Explain. (03)

**PART B**

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

**Module I**

11 a) What are different standards used to implement the Wireless Local Area Network (WLAN)? Explain by comparing. (07)

b) If a Signal to Interference Ratio (SIR) of 20dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity? The path loss (07)

exponent n=4. Assume there are 12 co-channel cells in first tier and all of them are at the same distance from mobile.

**OR**

12 a) Enumerate the different features of a 4G mobile communication system. (07)

b) How do co-channel interference and adjacent channel interference affect cellular system capacity? (07)

**Module II**

13 a) What is the importance of Two Ray model? Derive the expression for path loss in a two ray ground reflection model. (08)

b) A transmitter radiates a sinusoidal carrier frequency of 3GHz.For a vehicle moving at a speed of 72Kmph, compute the received frequency if the mobile is moving (06)

i) Directly towards the transmitter

ii) Directly away from the transmitter

**OR**

14 a) What is Fading? What are different types? What are the main factors affecting fading? (09)

b) Calculate the coherence time of a channel, if doppler shift is produced due to the movement of a mobile with a velocity of 50 m/sec and operating at 1900MHz. (05)

**Module III**

15 a) Derive expression for average probability of error in BPSK under Rayleigh flat fading, when the symbol duration is roughly equal to channel coherence time. (08)

b) How can the subcarrier fading be mitigated in multicarrier modulation system? (06)

**OR**

16 a) With the help of neat block diagram explain Multicarrier modulation in OFDM transmitter and receiver section. (09)

b) List out the advantages and disadvantages of OFDM (05)

**Module IV**

17 a) Derive the expression for the impulse response Heq(z), of a Minimum Mean Square Error (MMSE) equaliser. (07)

b) Compare Frequency Division Multiple Access (FDMA) and Time Division Multiple Access (TDMA) techniques. (07)

**OR**

18 a) Design a three tap zero forcing equaliser with following parameters P(0)=1, P(-1)=0.3, P(-2)=-0.05, P(1)= 0.2, P(2)=-0.06. (07)

b) Describe the principle of Selection Combining (SC) diversity technique. (07)

**Module V**

19 a) Derive an expression for the LOS distance in km when the antenna heights above ground are $h_t$ and $h_r$ respectively for the transmitter and receiver antennas. (07)

b) Analyze the effect of earth's magnetic field on radio wave propagation. (07)

**OR**

20 a) A receiving antenna is located 60km from the transmitting antenna. The Height of the transmitting antenna is 100meters. What is the required height of the receiving antenna. Consider effective radius of earth. (07)

b) Derive the relation between the terms (07)

(i) Critical Frequency

(ii) Skip Distance

(iii) Maximum Usable Frequency

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