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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (S,FE) (FT/WP) Examinations September 2026 (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		What is meant by frequency reuse in a cellular system.	(3)
2		What are the standards used for implementing Wireless Personnel Area Network (WPAN)?	(3)
3		Define Fraunhofer distance. Calculate the Fraunhofer distance for an antenna with maximum dimension of 1.2 m and operating frequency of 1200MHz.	(3)
4		Explain the relation between delay spread and coherence bandwidth	(3)
5		Write the expression for total bandwidth required for multi carrier modulation implementation with non-overlapping sub channels?	(3)
6		Define average error probability and outage probability.	(3)
7		Differentiate between linear and nonlinear equalizers. Give examples for each	(3)
8		Describe the selection combining technique used in diversity receivers.	(3)
9		Deduce the expression for critical frequency of an ionised region in terms of its maximum ionization density.	(3)
10		Define virtual height in antennas	(3)

PART B

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

Module I

11	a)	Explain the different methods of Handoff strategies adopted in cellular communication	(7)
	b)	List the important features of 4G networks	(7)

OR

12	a)	Describe the features of the WiMAX system architecture with the help of a neat block diagram.	(7)
	b)	Explain with necessary equations the relation between co-channel signal-to-interference ratio, cluster size and system in a cellular system.	(7)

Module II

13 a) Derive the expression for the impulse response model of a multipath channel (8)

b) Describe the concept of ergodic capacity in flat fading channels. Give the expression for capacity of flat fading AWGN channel with CSIR. (6)

OR

14 a) Compare and contrast flat fading with frequency-selective fading in wireless communication channels. (7)

b) Consider a flat-fading channel with i.i.d channel gains g[i] which can take on values g1=0.05 with probability p1=0.2, g2=0.4 with probability p2=0.4, and g3=1 with probability p3=0.5. The transmit power is 15mW, noise spectral density N0 = 10^{-10} W/Hz, and channel bandwidth is 50KHz. Assume instantaneous CSI-R, but transmitter does not have CSI. Compute the capacity of the channel. (7)

Module III

15 a) Derive expression for average probability of error in BPSK under Rayleigh flat fading when symbol duration is roughly equal to channel coherence time. (7)

b) Determine the average SNR per bit of BPSK modulation in Rayleigh slow-fading channel such that 95% of the times, average probability of bit error is less than 10^{-4}. (7)

OR

16 a) What is the need for multicarrier modulation in digital communication (5)

b) With suitable block diagram explain the implementation of an OFDM transmitter and receiver (9)

Module IV

17 a) Describe Alamouti scheme for 2x2 Multiple Input Multiple Output (MIMO) systems. (8)

b) Differentiate between macro and micro diversity (6)

OR

18 a) With necessary figures list out the features of TDMA,FDMA and CDMA (9)

b) With relevant figure explain the operation of a Zero forcing equalizer (5)

Module V

19 a) Derive expression for critical frequency , maximum usable frequency and skip distance (assume flat earth's surface) for sky wave propagation . (9)

b) Calculate the skip distance for flat earth with MUF of 10 MHz The wave is reflected from a height of 300km where the maximum value of refractive index is 0.9 and critical frequency is 5 MHz (5)

OR

20 a) With necessary figure explain ground wave , space wave and surface wave propagation (8)

b) A receiving antenna is located 65 km 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. (6)

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