

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

M.Tech-I Semester (ECE)

COURSE CODE(CREDITS):21M1WEC137

MAX. MARKS: 15

COURSE NAME: Advanced Cognitive Radio

COURSE INSTRUCTORS: Dr. Shweta Pandit

MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q1. a) Describe the concept of a 'cell' in cellular communication. How did this term originate, and what are the key considerations in designing and deploying cells in a cellular network?

[1][CO-1]

b) Fading is a key characteristic of wireless channels. What are the reasons for signal fading in wireless communication? Describe the impact of fading on signal transmission and how the use of multiple antennas can mitigate these effects.

[2][CO-1]

Q2. a) Differentiate among 1G to 5G generation along with its introduced new technologies, shortcomings and capabilities.

[2][CO-2]

b) What is the fundamental difference between licensed and unlicensed wireless technologies, and how does this distinction impact their use in commercial applications? Discuss the advantages and disadvantages of using unlicensed technologies like Bluetooth and Wireless LAN in comparison to licensed cellular technologies.

[2][CO-2]

Q3. a) What are the conceptual challenges and inherent limitations associated with the command-and-control or fixed spectrum allocation policy in managing the growing demand for wireless communication?

[2][CO-2]

b) What are different spectrum access methods to allow multiple users to access the channels? Describe their operations.

[2][CO-2]

Q4. a) Give the typical frequencies of the popular wireless services.

[1][CO-2]

b) A telecommunication company is planning to set up a wireless communication link between two locations, Site A and Site B, in a rural area. The company has to ensure that the received signal strength is sufficient for their new 5G network.

Details:

Site A (Transmitter):

Transmitted power=15 W, Transmitter antenna gain = 6, Height of transmitter antenna: 50 meters above ground level

Site B (Receiver):

Receiver antenna gain=8, Height of receiver antenna=50 meters above ground level

Frequency of operation: 3.5 GHz (typical for 5G), Distance between sites: 15 km.

The terrain between Site A and Site B is mostly flat, and there are minimal obstructions or interference sources. Calculate the wavelength of the signal in meters. Also, using the Friis transmission equation, determine the received power in watts and dBWatt at Site B. [3][CO-1]