

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

M.Tech-I Semester (ECE)

COURSE CODE (CREDITS): 21MIWEC131 (3)

MAX. MARKS: 25

COURSE NAME: Wireless Technologies for IoT

COURSE INSTRUCTORS: Dr. Shweta Pandit

AX. TIME: 1 Hour 30 Minutes

*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

- Q1. a)** What is the aim of umbrella cell approach? In the design of an IoT network, where this approach will be helpful? [2][CO-1][CO-4]
- b)** Mention the frequency range for sub-GHz frequency bands. Why they are an interesting choice for operation of wireless IoT devices? [2][CO-1]
- c)** What is the role of full function and reduced function devices in the topology of IoT network. Where the placement of these two different devices is appropriate in the IoT network? [1][CO-4]
- Q2 a)** A cellular system based IoT wireless system uses TDMA scheme which can tolerate a signal-to-interference ratio of 15dB in the worst case. Find the optimal value of N for (i) omni-directional antennas (ii) 120 degree sectoring, and (iii) 60 degree sectoring. Based on the result analysis comment on whether sectoring should be used or not. If yes then which case 120 or 60 degree sectoring? Assume path loss exponent of  $n=4$ . [4][CO-3]
- b)** Comment on each of the different criteria's to be considered for employing an IoT access technology for the IoT network deployment. [5][CO-4]
- Q3. a)** What are the important features of Zigbee technology and its application areas? How Zigbee IP is different from Zigbee? Explain the different components of the MAC frame of Zigbee IP standard. [4][CO-2]
- b)** A cell of wireless IoT network is split into smaller cells with each cell having radius one by fourth of the original cell. Find the ratio of the transmit power of the original to new cell when co-channel reuse ratio is kept same. (Assume path loss exponent value 3) [2][CO-4]
- Q4 a)** Compare the modulation schemes and frequency band of operation of each of the IEEE 802.15.4-2003, IEEE 802.15.4-2011, IEEE 1901.2a and LoRaWAN IoT technologies. Name different standardization Alliances for each of the above IEEE standards. [3] [CO-2]
- b)** Homeplug alliance deals with which of the IoT technology? Describe the use cases of the technology under Homeplug alliance and its MAC layer capabilities. [2] [CO-2][CO-3]