JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

B.Tech-VI Semester (ECE/Minor ECE)

COURSE CODE(CREDITS): 18B11EC611 (3) MAX. MARKS: 15

COURSE NAME: Wireless and Data Communication

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) Differentiate between multiple access and multiplexing. Name different multiple access and multiplexing techniques. **[1][CO-1]**

b) What is the distinguishing factor between source coding and channel coding employed in wireless communication system? Give at least two examples of source and channel coding techniques. **[1][CO1]**

c) Give comparative analysis of different wireless technology generations along with highlighting five key parameters that distinguishes them. **[2][CO-6]**

Q2 a) Define coverage area. Consider a cellular system designed so that $P_{min} = \bar{P}_r(R)$, i.e. the received power due to path loss and average shadowing at the cell boundary equals the minimum received power required for acceptable performance. Find the coverage area for path loss values γ=2 and $\sigma_{\psi dB} = 12$ in terms of Q-function. **[0.5+1.5][CO-3]**

b) Derive the equation for Doppler shift occur in cellular system due to movement of mobile station w.r.t. base station. Consider a cellular base station which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60 mph, compute the received carrier frequency if the mobile is moving **[1+2][CO-1]**

(i) directly towards the transmitter,
(ii) directly away from the transmitter,
(iii) in a direction which is perpendicular to the direction of arrival of the transmitted signal.

Q3. a) What is outage probability in wireless system? Find the outage probability at 150 m for a channel based on the combined path loss and shadowing models. Assume a transmit power of P_t =10 mW and minimum power requirement P_{min} = −110.5 dBm. Given K=-31.54dB, γ=3.71, $\sigma_{\psi dB} = 3.65dB$, and $d_0 = 1m$. **[0.5+1.5][CO-3]**

b) Define path loss, large scale and small scale fading. If a transmitter produces 50 watts of power, express the transmit power in units of dBm, and dBW. If 50 watts is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100 m from the antenna. What is received power at 10 km of distance from the transmitter? Assume unity gain for the receiver antenna. **[1+3][CO-3]**