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Question Paper Code: U6401

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Sixth Semester

Electronics and Communication Engineering

21UEC601- WIRELESS COMMUNICATION

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The process of transferring a mobile station from one base station to another is _____ CO1-U
(a) MSC (b) Roamer (c) Hand off (d) Forward channel
2. Reflection is _____ CO1-U
(a) Propagation mode (b) Propagation mechanism (c) DSSS (d) FHSS
3. Direct sequence spread spectrum demodulation uses----- CO1-U
(a) DPSK (b) FSK (c) ASK (d) QPSK
4. Which is more effective and commonly preferred technique? CO1-U
(a) Time diversity (b) Spatial diversity
(c) Frequency diversity (d) None of the above
5. What are the average upload speeds of our 4G LTE network? CO1-U
(a) 1-3 Mbps (b) 2-5 Mbps (c) 1-3 kbps (d) 1-3 bps

PART – B (5 x 3= 15 Marks)

6. Cellular system has 32 cells, each cell has 1.6 Km radius and the system reuse factor of 7. Determine the total geographical area covered. CO2-App
7. Find the Franhofer distance for an antenna with maximum dimension of 1m and operating frequency of 900 Mhz. if antenna have unity gain, calculate the path loss. CO3-App

8. Assume that $\theta_0 = 0$. The bit stream 0 0 1 0 1 1 is to be sent using $\pi/4$ DQPSK. CO3-App
The leftmost bits are first applied to the transmitter. Determine the phase of θ_k , and the values of I_k, Q_k during transmission.
9. Consider the design of the U.S Digital Cellular Equalizer. If the carrier CO4-App
frequency is 900 MHz and the maximum Doppler shift is 66.67 Hz.
10. How does cognitive radio technology address spectrum scarcity issues? CO1-U

PART – C (5 x 16 = 80 Marks)

11. (a) If a total of 33 MHz of bandwidth is allocated to particular FDD CO2-App (16)
cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses (a) four-cell reuse, (b) seven -cell reuse, and (c) 12-cell reuse. If 1 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the three systems.
- Or
- (b) If a signal-to-interference ratio of 15 dB is required for CO2-App (16)
satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (a) $n = 4$, (b) $n = 3$? Assume that there are six co-channel cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations.
12. (a) A mobile is located 5 km away from a base station and uses a CO3-App (16)
vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be 10^{-3} v/m. The carrier frequency used for this system is 900 MHz.
(a) Find the length and the effective aperture of the receiving antenna.
(b) Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50m and the receiving antenna is 1.5m above ground.

Or

- (b) Compute the median path loss using Okumura's model for $d=50\text{km}$, $h_{te}=100\text{m}$, $h_{re}=10\text{m}$ in a sub urban environment. If the base station transmitter radiates an EIRP of 1 KW at a carrier frequency of 900 MHz, Calculate the power at the receiver.(Assume unity gain receiving antenna) CO3-App (16)
13. (a) Analyze the probability of error expressions for QPSK and GMSK in a slow flat-fading channel, where the received signal envelope has a Rician probability distribution. Compare the results. CO6-Ana (16)
- Or
- (b) Design a Frequency hopped spread spectrum system that has frequency synthesizers controlled by five shift registers with feedback connection taken from second and fifth stages. CO6-Ana (16)
14. (a) Design an LMS equalizer for a wireless system whose output should be a Nyquist pulse for a single symbol case. CO4-App (16)
- Or
- (b) Assume that the signal is transmitted from a mobile with vertical (or horizontal) polarization. It is received at the base station by a polarization diversity antenna with 2 branches. Analyze the correlation coefficient and signal loss in terms of polarization factors. CO4-App (16)
15. (a) Explain the Impact of radiations in 4G & 5G wireless system that meets the specified needs with appropriate consideration for the public health and safety, and the societal and environmental considerations. CO1-U (16)
- Or
- (b) Explain in detail how LP-WAN are used to increase device density, penetration power, and battery life. CO1-U (16)

