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JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular), November 2017

B. Tech in Electronics & Communication Engineering, Semester - VII

Roll No.....

ECE702: WIRELESS COMMUNICATION

Time: 3 hours

Max. Marks: 100

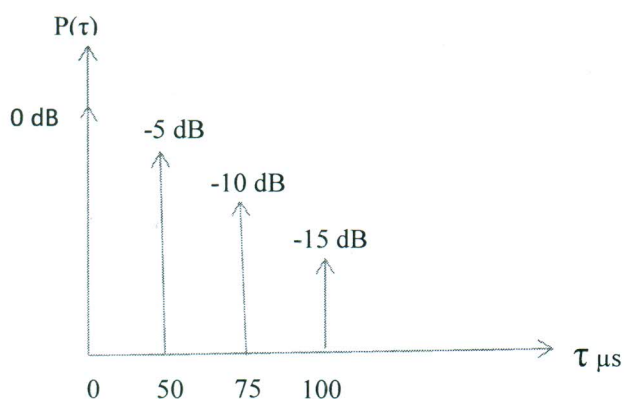
Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. A smaller value of handoff margin leads to _____.
(a) unnecessary handoff (c) insufficient times to complete the handoff
(b) lightly loaded BSCs (d) None of the above
- ii. Larger cells are more useful in _____.
(a) Densely populated urban area (c) rural areas
(b) lightly populated urban areas (d) mountainous area
- iii. The far-field distance for a BS antenna with largest dimension of 0.5m and operating with a frequency of 1800 MHz will be _____.
(a) 3.6 m (b) 3 m (c) 4.5 m (d) 6 m
- iv. Okumura Model is applicable for frequency range _____.
(a) 150 KHz to 3000 KHz (b) 2 to 20 GHz
(c) 150 to 1920 MHz (d) any frequency
- v. The offset QPSK modulation technique has a maximum phase shift of _____.
(a) 180° (b) 45° (c) 135° (d) 275°
- vi. GMSK modulation technique is derived from _____.
(a) Binary PSK (b) Binary CPFSK (c) Binary FSK (d) QPSK
- vii. The multiple access technique used in GSM system is _____.
(a) FDMA (b) CDMA (c) TDMA (d) OFDMA
- viii. If the *rms* delay spread is 1.37, then the coherence bandwidth for just above 50% correlation will be _____.
(a) 156 KHz (b) 146 KHz (c) 137 KHz (d) 256 KHz
- ix. In a typical mobile communication system, 416 channels are allocated to various cellular operators. The channels are of 30 KHz with guard band of 10 KHz. Then the spectrum allocated to each operator will be _____.
(a) 24 MHz (b) 12.5 MHz (c) 22.5 MHz (d) 8.5 MHz
- x. In order to achieve space diversity, the minimum spacing between antennas should be approximately _____.
(a) 2λ (b) 0.4λ (c) 10λ (d) 5λ

- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- What is adjacent channel interference? State the reason for its occurrence. Suggest some procedure to counter this interference.
 - For theoretical analysis, which shape is considered for cellular cell & Why?
 - What is indoor propagation model? How it is different from large propagation model? Specify the path-loss equation for any indoor model.
 - Briefly explain the various factors which affect the small scale fading.
- Q.3A By using geometric arguments, show that the frequency reuse ratio, q , for cellular deployments based on hexagonal cells is given by $D/R = \sqrt{3N}$, where 'D' is the distance between two co-channel cells & 'R' is the cell radius. 05
- Q.3B What is system capacity? As wireless communication engineer, what are the different techniques you will suggest for improving the system capacity? Which technique will be appropriate for a particular scenario? 05
- Q.4A The minimum S/I requirement of a cellular system is 18 dB. Calculate the worst case signal to co-channel interference ratio for cluster size of 7 and path loss exponent of 4. As a service provider, will you prefer the existing architecture or modify it. Make comment with full justification. 05
- Q.4B As a wireless system engineer, how important is the channel assignment & why? Make a comparison among FCA & DCA in terms of at least five performance parameters. 05
- Q.5A Briefly explain the procedure to classify the small scale fading channel through various channel parameters. 05
- Q.5B For the following power delay profile, determine the mean access delay, rms delay spread. Now if a particular modulation provides suitable BER performance whenever, $\frac{\sigma_\tau}{T_s} \leq \frac{1}{10}$, determine the smallest symbol period T_s that may be sent through RF channel without using equalizer. (Refer Fig. X) 05



(Fig. X- Power delay profile - for Q.No.5 B)

- Q.6A An Indoor Wireless LAN is operating at 5 GHz in a cell radius of 10m & uses Omni-Directional antenna. In order to ensure a received power of 10 μ w by all terminals within the cell, calculate the required transmit power under free space path loss model. Determine the path loss of such environment in dBm. (Assume unity gain antennas). 05
- Q.6B What is Doppler shift? A mobile receiver is tuned to a transmission of 800 MHz and receives signal with Doppler Frequencies ranging from 10 Hz to 50 Hz when moving at a speed of 80 km/h. Calculate the beam width of the mobile antenna? 05
- OR
- Q.6B Describe in brief the different multiple Access techniques and suitably compare them. 05
- Q.7A Make a simple comparison of 2G, 3G & 4G in terms of data rate, access technology, modulation and other parameters. 05
- Q.7B Approximately how large can the rms delay spread be in order for a binary modulated signal with a bit rate of 25 kbps to operate without an equalizer? What about an 8-PSK system with a bit rate of 75 kbps? 05
- OR
- Q.7B Draw the circuit of a RAKE Receiver. Briefly explain its principle. Where this type of receiver is used? 05
- Q.8A State the basic characteristics of $\frac{\pi}{4}$ -shifted DQPSK. Draw the block diagram for transmitter & receiver of $\frac{\pi}{4}$ -shifted DQPSK and explain properly. 10
- Q.9A What is spread spectrum modulation techniques? Classify all the spread spectrum modulation techniques and briefly explain the principle of each technique. Draw the block diagrams of both DSSS & FHSS modulation transmitters and briefly explain them. 10
- Q.9B State the purpose of implementing diversity techniques in any wireless communication system. Mention the various types of diversity techniques possible. Mention & explain in details the various diversity techniques employed. 10
- OR
- Q.9B A cellular system operates at a carrier frequency of 1800 MHz. It uses the Base Station & Mobile Station transmitters with a height of 120 m & 8 m respectively. Find the median path loss using Okumura's model for a distance of 20 km in a suburban environment. If the base station transmitter radiates an EIRP of 1 kW, find the power at the receiver. If environment is changed to quasi-open area, find the distance at which same power will be received. (Assume a unity gain receiving antenna). (Refer the following Okumura Curves given as Fig. Y in the last page) 10

