

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), Nov.-Dec. 2015

B. Tech in Electronics & Communication Engineering, Semester VII

Roll No.....

ECE721: 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.	What do you understand with DECT?	
ii.	What is the IEEE standard for Bluetooth technology?	
iii.	A wireless communication transmitter has an RF power of 10 W and Transmitter antenna gain of 3 dB. The EIRP is a) 30 W b) 3.33 W c) 10 W d) 20 W	
iv.	What do you understand with Nyquist Criteria?	
v.	What is the full form of LTE?	
vi.	For bursty long messages and small number of subscriber, the multiple access technique used is a) Pure ALOHA b) Slotted ALOHA c) Reservation ALOHA d) Packet Radio Multiple Access	
vii.	The purpose of user traffic data is to improve the signal quality by distributing the effects of fading. a) Speech coding b) Channel coding c) Bit interleaving d) Equalization	
viii.	In the 800 MHz band cellular system the duplex separation is specified as a) 20 MHz b) 45 MHz c) 25 MHz d) 80 MHz	
ix.	What is the difference between Rayleigh and Rician fading channels?	
x.	What do you understand with slow fading channels?	

Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i.	The basic frame structure of a GSM system comprise of 156.25 bits in a time slot, of which 40.25 bits are overhead (ignoring the 2 flag bits). Compute the frame efficiency.	
ii.	The IEEE 802.11 WLAN system operates at 2 Mbps. Determine the data transfer time of 20 kbytes file.	
iii.	If the delay spread is 1 microsecond, will the two different frequencies that are 1 MHz apart, experience correlated fading?	
iv.	A US AMPS analog cellular is allocated 12.5 MHz for each simplex band. If the guard band at either end of the allocated spectrum is 10kHz, and the channel bandwidth is 30 kHz, find the number of channels available in an FDMA system	
Q.3A	Explain the 4x4 MIMO Systems in detail.	05
Q.3B	An FHSS system employs a total bandwidth of 400 MHz and an individual channel bandwidth of 100 Hz, what is the minimum number of PN bits required for each frequency hop?	05
Q.4A	Explain Bluetooth protocol architecture in detail using suitable diagrams.	05
Q.4B	Explain least mean square (LMS) algorithm for adaptive equalization.	05
Q.5A	Explain different types of space diversity techniques in detail.	05
Q.5B	What may be the symbol rates for QPSK, 8 PSK and 16 PSK schemes if the bit rate is 256 Mbps?	05
Q.6A	Justify the OFDM is a spectrally efficient technique compared to FDM.	05
Q.6B	Determine the propagation path loss for a radio signal at 900 MHz cellular system operating in a large urban city, with a base station Transmitter antenna height of 100 meter and mobile Receiver antenna height of 2 meter. The mobile unit is located at a distance of 4 Km. Use the Hata propagation path loss model.	05
	OR	
Q.6B	A wireless communication transmitter transmits a signal at 900 MHz. A receiver located at a distance of 1 Km away from transmitter receives two signals, one line-of-sight signal and another indirectly via reflection from a building (having a height more than 10 meters). Give reasons to justify that the reflected signal causes delay in the reception. Calculate the amount of delay in the reflected signal with respect to the direct signal at the receiver	05
Q.7A	What is the significance of Frequency hopping spread spectrum (FHSS). Explain fast FHSS using suitable diagrams.	05
Q.7B	What are the key issues for the contention-based multiple access protocols? How is it different from contention free multiple access techniques?	05
	OR	
Q.7B	Consider GSM, which is a TDMA/FDD system that uses 25 MHz band for the forward link, which is divided into radio channels of 200 kHz each. If 8 speech channels (time slots) are supported on a single radio channel, find the number of simultaneous subscribers that can be accommodated in GSM, assuming no	05

guard band.

- Q.8
- i. Assume a cellular system of 32 cells with a cell radius of 1.6 Km, a total spectrum allocation that supports 336 traffic channels, and a reuse pattern of 7. Calculate the total service area covered with this configuration, the number of channels per cell, and a total system capacity. (Assume regular hexagonal cellular topology with area $A_{\text{cell}} = 3 \sqrt{3/2} * R^2$)
 - ii. Let the cell size be reduced to the extent that the same area as covered in part (i) with 128 cells, Find the radius of the new cell and new system capacity.
- Q.9
- Compute the maximum throughput of a pure ALOHA network with a large number of subscriber and a transmission rate of 1 Mbps. Determine the throughput of a TDMA network with the same transmission rate. What is the throughput of the ALOHA network if only one subscriber is active?
- OR
- Q.9
- Explain IEEE 802.11 WLAN protocol architecture in detail.
- Q.10
- GSM uses a frame structure where each frame consists of 8 time slots, and each time slot contains 156.25 bits and data is transmitted over a channel at 270.833 kbps. Find time duration of a bit; time duration of a slot; time duration of a TDMA frame; and how long must a user wait when occupying a single time slot between two successive transmissions.
- OR
- Q.10
- Draw the GSM network architectural model and explain its various subsystems and interfaces.