JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech-V Semester (ECE)

COURSE CODE (CREDITS):25B1WEC542(3)

MAX. MARKS: 15

COURSE NAME: Wireless and Mobile Communication

COURSE INSTRUCTOR: Dr. Shweta Pandit MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(c) Use of calculator is allowed

(d) For Q2, use the provided Erlang-B chart provided.

Q.No	Question	CO	Marks
Q1	a) Explain the suitability of hexagonal geometry for representing cells in a cellular communication system. Compare it with other possible geometrical representations and justify why the hexagonal model is preferred?	1	[1]
	b) Analyze the operation of TDD and FDD techniques in providing apparently simultaneous transmission and reception of voice signals. Compare their working principles, advantages, and limitations		[1.5]
	c) Construct a detailed timing diagram illustrating the complete call progression from a mobile user to a landline subscriber. Identify the sequence of interactions among the various entities of the cellular system and indicate the channels involved at each stage.		[2.5]
Q2	a) Analyze the role of trunking and queuing theory in cellular systems and evaluate how Grade of Service (GOS) affects the design and performance of a cellular network?	2	[1]
	b) A cellular network is experiencing capacity limitations in a high-traffic region. Analyze how cell splitting can be used to increase system capacity. If the radius of each new cell is reduced to half of the original cell radius, calculate the required transmit power by keeping same frequency reuse plan.		[1]
	c) Mention the advantage of sectoring as compare to omni-directional antenna system. For a system with a *Pr[Blocking]=1%* and average call length of *2 minutes*, find the traffic capacity loss if there are total *395* traffic channels for a 7-cell reuse system when going from omni-directional antennas to *(i)* 120 degree sectoring, and *(ii)* 60 degree sectoring. Assume that blocked calls are cleared and the average per user call rate is λ*=1 per hour*. (Erlang-B table		[3]

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	provided)		
Q3	a) Analyze the umbrella cell approach used in cellular systems. Explain its working principle, advantages, and applications in cellular network design.		[1]
	b) Pretend your Company won a license to build an Indian cellular system. Your license is to cover Waknaghat and its some nearby areas of around *140 square km*. Assume a base station costs *Rs.500,000* and MTSO costs *Rs.1,500,000*. An extra *Rs.500,000* is needed to advertise and start the business. You have convinced the PNB bank to loan you *6 million* rupees with the idea that in four years you will have earned *10 million* in gross billing revenues and will have paid off the loan.	2	[4]
	i.) How many base stations (i.e. cell sites) will you be able to install for *6 million* rupees?		
	ii.) Assuming the earth is flat and subscribers are uniformly distributed on the ground, what assumption can you make about the coverage area of each of your cell sites? What is the major radius of each of your cells, assuming a hexagonal mosaic?		
	iii.) Assume that the average customer will pay *Rs. 299* per month over a four year period. Assume that on first day you turn your system on, you have a certain number of customers which remains fixed throughout the year. On the first day of each new year the number of customers using your system doubles and then remains fixed for the rest of the year. What is the minimum number of customers you must have on the first day of service in order to have earned *10 million* rupees in gross billing revenues by the end of the fourth year of operation?		
	iv.) For the answer obtained in part (iii), how many users per square km are needed on the first day of service in order to reach the *10 million* rupees mark after the 4^{th} year?		

JUIT TEST-2 ... 2016