

Name:	 UPES UNIVERSITY OF TOMORROW
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Cellular & Mobile Communication
Program: B. Tech ECE
Course Code: ECEG 4032

Semester: VII
Time 03 hrs.
Max. Marks: 100

Instructions: Answer all the questions.
Diagrams must be neat and clean.
Use Black and Blue pen for sketching the diagram

SECTION A

Each Question will carry 4 Marks

Instruction: Complete the statement / Select the correct answer(s)

S. No		
Q 1	Mention the name of at least four specified quality that are superior in 5G mobile technology as compared to 4G mobile technology.	CO2
Q 2	Mention the multiple access techniques were used in GSM, AMPS, LTE-A and HSPA based mobile technology.	CO1
Q 3	A city has been allotted a FDD ranging from 400 MHz to 450 MHz for uplink and channel spacing is 100 MHz for an AMPS system. The voice bandwidth of each channel is 10 kHz. Find the number of call connection and last downlink frequency.	CO2
Q 4	Which class of handover does roaming belongs to? Why the cell in mobile communication is hexagonal in shape?	CO2
Q 5	A hostel needs to deploy the Wi-Fi router for accessing the data. Which frequency band of router is appropriate for better speed and why?	CO1

SECTION B

Each question will carry 10 marks

Instruction: Write short / brief notes

Q 6	Write down the salient features of Frequency Division Multiple Access. How the available channel numbers in FDMA are found out?	CO1
-----	--	------------

Q 7	A city with a coverage area of 2000 sq km is served with a 7-cell system. The area of each cell is 8 sq km. If the allocated spectrum for cellular mobile is 250 MHz with a channel bandwidth of 25 kHz, then determine the number of channels per cell in the area and the capacity of the system. Also compute at what distance from the cell tower the handoff threshold occurs.	CO3
Q 8	Sketch the System Architecture of 4G technology with a cellular structure. Mention all the radio interfaces utilizing voice and data services, each system and subsystem part of this architecture.	CO2
Q 9	Priya is a mobile subscriber of Airtel and she is living in Kolkata, whereas same mobile operator also served her friend Payal who lives in Ranchi. The service provided by the mobile operator is based on LTE system and the same EPC is used to serve the subscribers in eastern part of India. Write down every process of how a call is connected for voice communication from Priya to Payal.	CO3

SECTION-C

Each Question carries 20 Marks.
Instruction: Write long answer.

Q 10	<p>If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone system that uses two 25 kHz simplex channels to provide full duplex voice and control channels, then, compute the number of channels available per cell if a system uses</p> <ul style="list-style-type: none"> (a) Cell configuration in which $i = 0, j = 2$ (b) Cell configuration in which $i = 1, j = 2$ (c) Cell configuration in which $i = 2, j = 3$ <p>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. Also, if the area of one cluster is fixed to be 8400 sq.m, then compute the radius of each cell in the three mentioned cases of cell configuration above.</p> <p style="text-align: center;">or</p> <p>Design a Viterbi decoder using trellis diagram.</p> <p>The coder is consisting of 3 shift-registers, and the code vector from the output of shift register are $V_1 = S_1 + S_2 + S_3, V_2 = S_1 + S_3$.</p>	CO3
------	--	-----

	<p>If the input bit sequence to this decoder is 01 10 11 10 11 01. Then determine whether this received bit is correct or not? If there is an error, then find the correct code.</p> <p>From the correct code, determine the message input.</p>	
Q 11	<p>A cellular operator assigned the task of laying the cellular tower of one engineer group, known as CMCB1, whereas the second engineer group, termed as CMCB2, task is to investigate the significant carrier level and sectoring.</p> <p>The cellular operator planned to operate in a new town, and hence CMCB1 divide the town in 50 clusters and installed the tower with $N = 7$ structure. The propagation constant of the path loss for the environment is 4. However, in few months it was noticed that with the growing number of cellular customers in the area, the call quality started to be degraded. On inspection by CMCB2 it was found that the value of C/I is far away from the calculated one.</p> <p>The operator asked the CMCB2 group for sectoring the existing cell without any addition of base tower installation to increase the C/I ratio. Compute the value of C/I and optimal value of N for</p> <ul style="list-style-type: none"> (i) omni-directional antennas. (ii) 180° sectoring. (iii) 120° sectoring. (iv) 60° sectoring. 	CO4
