Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Course: Wireless Communication — **Semester: VIII**
Program: B. Tech Electronics Engineering — **Time 03 hrs.**
Course Code: ELEG 422 — **Max. Marks: 100**

Instructions: Answer all the questions.
Diagrams must be neat and clean.
Use 2 different colors of pen/pencil in drawing cell diagram.

SECTION A

S. No		Marks	CO
Q 1	Write down the salient features of Frequency Division Multiple Access.	5	CO1
Q 2	Draw the frame structure of GSM in context of Time Division Multiple Access cum Frequency Division Duplexing.	5	CO2
Q 3	Comment on the feature of preferable digital modulation technique used in GSM.	5	CO3
Q 4	State different specification of GSM.	5	CO4

SECTION B

Q 5	Define hand-off and describe it with the help of neat and clear diagram in cellular mobile system? State and differentiate between inter system hand-off and intra system hand-off.	10	CO3
Q 6	Compute the convolutional code vector for a 3-bit message.	10	CO3
Q 7	Sketch the GSM Network System Architecture with all the radio interfaces and at least two clusters of cells.	10	CO4
Q 8	If 25 MHz of total spectrum is allocated for a duplex wireless cellular system and each simplex channel has 20 kHz RF bandwidth. Find (a) The number of duplex channels (b) The total number of channels per cell size if N=4 reuse pattern is used.	10	CO4

SECTION-C

Q 9	A cellular engineer designed a particular cell with the employment of the	20	CO3

	omnidirectional antenna. The C/I ratio is mentioned as 18 dB as desired by the structure. 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. A particular solution to improve the call quality is increasing the signal strength, but the operator does not grant this solution. The operator asked the system engineer for splitting the existing cell without any addition of base tower installation. How the system engineer will go through to improve the C/I. Also, compute the optimal value of N for (i) omni-directional antennas, (ii) 120^0 sectoring, and (iii) 60^0 sectoring. Assume the value of path loss exponent to be 4.		
Q 10	Design a clusters of hexagonal cell for the following three conditions (i) i =2, j=1. (ii) i =1, j=1. (iii) i =2, j=2. In the cellular structure clearly locate the position of Co Channel cell in (a) first complete tier and (b) one cell in second tier. In the same design, if the area of each cell is 4 km^2, and the total coverage of the city is 2000 km^2, then find the system capacity for the above three mentioned (i, ii, iii) structure.	**20**	**CO4**

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SECTION A

S. No		Marks	CO
Q 1	Write down the salient features of Time Division Multiple Access.	5	CO1
Q 2	Draw the frame structure of GSM in context of Time Division Multiple Access cum Frequency Division Duplexing.	5	CO2
Q 3	Why MSK technique is used in GSM and not QPSK. Comment on the salient feature in contest with this.	5	CO2
Q 4	State the flow of GSM operation.	5	CO3

SECTION B

Q 5	What is the difference between Roaming and hand-off. Discuss the process of hand-off with the help of neat and clear diagram in cellular mobile system? Differentiate between inter system hand-off and intra system hand-off.	10	CO3
Q 6	Find the convolutional code vector for the messages 1011, 1010, 1001, 0011, 1111 and 1100. The no. of shift registers is 3.	10	CO4
Q 7	Draw a systematic diagram showing the complete wireless and wired interface in GSM architecture along with at least 3 clusters. .	10	CO2
Q 8	If a normal GSM time slot consists of 6 trailing bits, 8.25 guard bits, 26 training bits, and 2 traffic bursts of 58 bits of data, find the (a) frame efficiency, (b) time duration of bit, (c) transmission speed of the frame.	10	CO1

	SECTION-C		
Q 9	A cellular service provider decides to use a digital TDMA scheme which can tolerate a signal-to-interference ratio of 15 dB in the worst case. Find the optimal value of N for (i) omni-directional antennas, (ii) (ii) 120^0 sectoring, and (iii) (iii) 60^0 sectoring. If the improvement is done using sectoring than which sectoring out of 60° or 120° is used. Assume a path loss exponent of value 4.	**20**	**CO3**
Q 10	Design a clusters of hexagonal cell for the following three conditions (iv) i =2, j=1. (v) i =1, j=1. (vi) i =2, j=2. In the cellular structure clearly locate the position of Co Channel cell in (c) first complete tier and (d) one cell in second tier. In the same design, if the area of each cell is 4 km^2, and the total coverage of the city is 2000 km^2, then find the system capacity for the above three mentioned in (i, ii, iii) structure.	**20**	**CO4**