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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B. Tech Electronics Engineering.
Subject (Course): Wireless Communication
Course Code : ELEG 422
No. of page/s: 02

Semester – VII
Max. Marks : 100
Duration : 3 Hrs

Note: 1) Answer in brief and to the points.
*2) Answer **all** questions.*

Part A (20 Marks)

[4×5 = 20]

1. Write down the features of Code Division Multiple Access.
2. What is GPRS? Write down its features.
3. Describe frame structure of TDMA in context of GSM.
4. Make a critical comparison between the two widely used 2nd generation cellular mobile technology services based on time and code division multiple access.

Part B (40 Marks)

[4×10 =40]

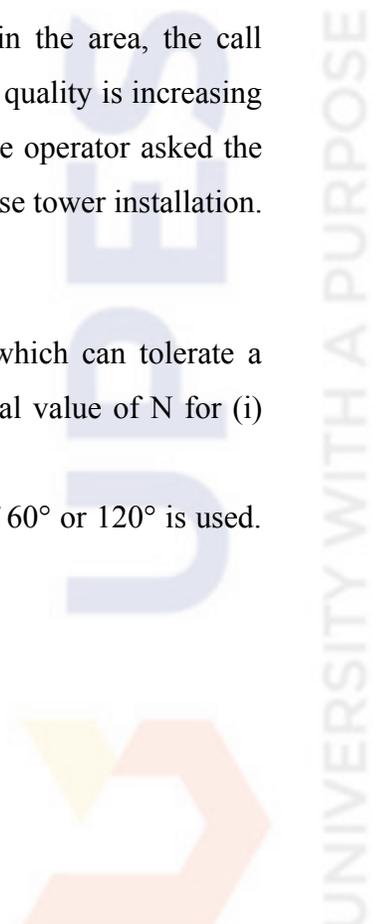
5. Define hand-off and describe it with the help of neat and clear diagram in cellular mobile system? Also differentiate between inter system hand-off and intra system hand-off
6. Draw a systematic diagram showing the complete wireless and wired interface in GSM architecture along with at least 3 clusters. .

7. A 4-bit message is coded using polynomial code having generator as $1+x+x^3$. Find the code vector for 1010, 1100, 1111, 0000 and 1001.
8. Find the convolutional code vector for the messages 1011, 1010, 1001, 0011, 1111 and 1100. The no. of shift registers is 3.

Part C (40 Marks)

[2×20 =40]

9. A cellular engineer designed a particular cell with the employment of the omnidirectional antenna. The C/I ratio is mentioned as 21 dB as desired by the structure. But 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 this solution is not granted by the operator. 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.
10. 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) 120° sectoring, and (iii) 60° 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.



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Part A (20 Marks)

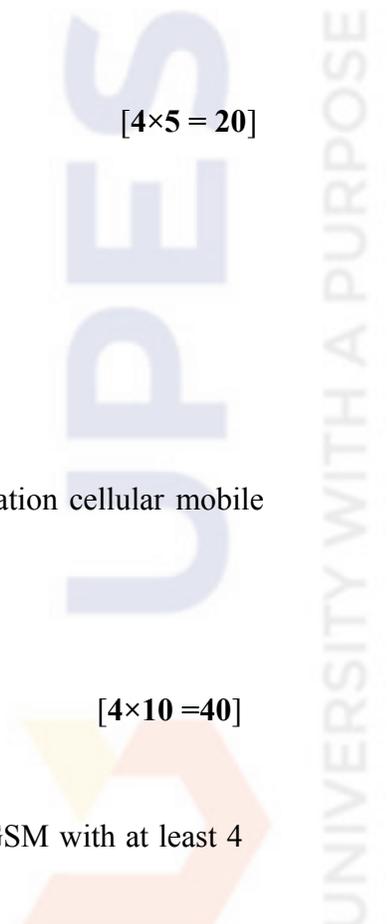
[4×5 = 20]

1. Write down the features of Frequency Division Multiple Access.
2. What is EDGE? Write down its features.
3. Describe frame structure in GSM.
4. Make a critical comparison between the two widely used 2nd generation cellular mobile technology services based on time and code division multiple access.

Part B (40 Marks)

[4×10 =40]

5. Draw a systematic diagram showing the complete architecture of GSM with at least 4 cluster.
6. A 4-bit message is coded using polynomial code having generator as $1+x+x^3$. Find the code vector for 0010, 1110, 1011, 0100 and 1101.



7. Find the convolutional code vector for the messages 1001, 1000, 0001, 0011, 1110 and 0101. The no. of shift registers is 3.
8. What do you mean by the term roaming in cellular telephony? Explain it with the help of neat diagram with reference to hand-off.

Part C (40 Marks)

[2×20 =40]

9. A cellular engineer designed a particular cell with the employment of the omnidirectional antenna. The C/I ratio is mentioned as 18 dB as desired by the structure. But 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 this solution is not granted by the operator. 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.
10. If a signal to interference ratio of 16 dB is required for satisfactory forward channel performance of a cellular system, then determine the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (a) 4 and (b) 3. Assume that there are 6 co-channels cells in the first tier and all of them are at the same distance from the mobile. Use suitable approximations and draw the diagram also.
