## (يسمح للطالب بإدخال ورقة قوانين جهة واحدة A4 وجداول Erlang مع ضرورة كتابة الاسم عليها وتسليمها مع كراسة الاجابة)

Q1. (6 Marks) A satellite at a distance of 40000 km from an earth station radiates a power of 3 W from an antenna with a gain of 15 dB in the direction of the earth station. If the receiving antenna has an effective area of  $10 \ m^2$ , find the flux density and the power received by the antenna?

Q2. (6 Marks) An earth station antenna is located at 89°W longitude and 35°N latitude. It is intended to transmit and receive signals to a satellite in geostationary orbit at 82°W longitude. Calculate Satellite Range from earth station?

Q3. (6 Marks) Derive the co-channel reuse ratio for a hexagonal geometry, where  $N = i^2 + ij + j^2$  is used to find the nearest co-channel neighbors for a particular cell?

Q4. (8 Marks) A cellular system with cluster size of 7, probability of blocking of 1%, average call duration of 2 minutes, each user has a call rate of 1 call per hour, and omnidirectional antenna cells with 60 traffic channels each. Assuming that blocked call cleared system is used, Find the following:

- a) Maximum number of users that can be supported per cell.
- b) Co-channel reuse ratio and frequency reuse distance, if the cell radius is 1.3 km.
- c) Traffic capacity loss due to trunking the traffic channels when going from omnidirectional to 60° sectored antennas.
- d) What is co-channel interference? And how it can be reduced?

Q5. (12 Marks) Consider a GSM system with spectrum allocation of 890-915MHz UL and 935-960MHz DL, with channel spacing of 200 kHz and a reserved guard band of 100 kHz at the beginning and the end for each of the UL and DL spectrum and 8 voice channels per digital channel.

- A. How many voice channels in this system?
- B. Calculate the cluster size N for this system if the required signal to interference ratio S/I is 14 dB and the path loss exponent n= 4? (Assume that there are 6 co-channels cells in the first tier, and all of them are at the same distance from the mobile)
- C. Calculate the Co-channel distance?
- D. What is the number of voice channels per cell in GSM under the given S/I condition?
- E. How many omnidirectional base stations having 2 km coverage radius are required to cover an area of 312 km<sup>2</sup>? Use the hexagonal cell shape?
- F. What is the maximum number of simultaneous users in the network?

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a) Speech compression

اسم الأستاذ/المنسق: حسام الدين الهنشيري.

(12 Marks, 0.5 each) Choose the correct answer: (your selection must be on the exam paper) 1. Modulation used in GPS is called Direct Sequence Spread Spectrum b) False a) True 2. The rain attenuation is caused by ...... of electromagnetic waves c) Both (a and b) b) Absorption a) Scattering 3. Cellular communication systems are ..... c) Full duplex b) Half duplex a) Simplex 4. First Generation (1G) Cellular Mobile Radio Systems use c) Analog / FM / TDMA b) Analog / FM / FDMA a) Analog / AM / FDMA 5. Power control enables MS's and BTS s to increase or decrease the transmission power b) False a) True 6. Which one of the following is NOT a technique to reduce the effects of multi-path fading? d) Diversity c) Sectorization b) Equalization a) Frequency hopping 7. .....is the dialed number to reach to MS c) MSRN b) IMSI a) MSISDN 8. Which type of coding provides error protection in GSM b) Convolutional coding c) GMSK a) Encryption coding 9. ..... connects PLMN with other networks c) BSC b) GMSC a) MSC 10. One of the main Cellular System problems is interference due to ...... b) Sectoring c) Frequency re-use a) Trunking 11. Frequency re-use is used to ..... b) Increases capacity c) Both (a and b) a) Reduce interference 12. If cluster size (N = 7) and cell Radius (R = 1.5 km), then the co-channel re-use ratio is c) 6.87 b) 5.66 a) 4.58 13. Fixed Channel Allocation has c) Maximum frequency reuse b) Channel Borrowing a) High call setup delay 14. GSM-R Standard is used for b) Railway c) Both (a and b) a) Rural environment 15. Transcoding and Rate Adaptation Unit (TRAU) is used for

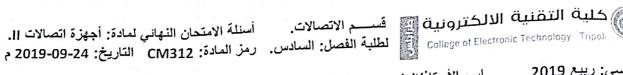
b) Rate Adaptation

c) Both (a and b)

a) Increase

a) Physical channel

27. Timeslot represents.....



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16. In GSM system Kc key is u		
a) Cyphering	b) Authentication	c) Triples generation
17. Modulation technique used	in GSM is:	
a) 8ASK	b) GMSK	c) 8PSK
18. Temporary information of u	sers is stored in	الوالجنة امتحانات في
a) MSC	b) VLR	c) HLR
19. The function of MSC is		15. 15. 15. 15. 15. 15. 15. 15. 15. 15.
a) Paging	b) Channel coding	c) Switching and call routing
20. The new Hardware elements	have to be implemented for GPRS n	etwork are
a) GGSN and SGSN	b) GGSN, SGSN and PCU	
21. With GPRS it is possible to o	combine 1-8 physical channels for on	ne user
a) True	b) False	
22. Modulation technique used in	n EDGE is	
a) 8ASK	b) GMSK	c) 8PSK
23is used overcome r	near far problem.	
a) Sectorization	b) Power control	c) Rake receiver
24. Cell splitting co-	-channel interference.	, , , , , , , , , , , , , , , , , , , ,
a) Increase	b) Decrease	c) does not affect
25. Cell splitting technique	the capacity	
a) Increase	b) Decrease	c) does not affect
6. Cell sectoring technique	the capacity	, == - and alreot
그 없는 그 이렇게 하는 바람이를 하는 것이다. 그런 하는 그 그 그 없는데	- III	

Good Luck

b) Decrease

b) logic channel

c) does not affect

c) control channel