Mansoura University
Faculty of Engineering
Electronic and Electrical Comm. Dept.   Full mark [100]

Exam on Mobile Communication Systems
4th Year, 2nd Term 2012-2013
Date: 5/6/2013 , Six Pages, Time: 3 Hours

Q1. Choose the correct answer, <u>Put your answer in the table shown in Page 6</u>   [70 marks]

1. The type of access used in GSM technology is

a) CDMA/TDMA	b) TDMA/FDMA	c) FDMA/CDMA

2. The coverage & capacity of NMT450 system is more than that of GSM system

a) True	b) Equal	c) False

3. The downlink frequency of P-GSM system is

a) 935-960Mhz	b) 45Mhz	d) 890-915 MHz

4. The technique adopted to increase the system capacity and reduce co-channel interference is

a) High power BTS	b) Use Omni-directional antenna	c) Sectorisation

5. The remote and sparsely populated areas will be covered by

a) Microcell	b) Picocell	c) Macrocell

6. Which of these cells are used for areas of n=4

a) Microcell	b) Picocell	c) Macrocell

7. The cell using the same set of RF channels in the adjacent cluster are termed as

a) adjacent cell	b) Co-channel cell	c) Selective cell

8. Higher value of Q is achievable in

a) big cluster size	b) medium cluster size	c) small cluster size

9. The terminal is under observation from the network for the possible problems will be in……..in EIR

a) White List	b) Black List	c) Grey List

10. The process of channel coding, Encryption, Multiplexing and modulation for Trans direction and reverse for reception are to be carried out by

a) BTS	b) BSC	c) MSC

11. The GSM was originated in   (Global System for Mobile) in the year 1990

a) Japan	b) USA	c) Europe

12. The ………………is a database that contains information about the identity of mobile equipment that prevents calls from stolen, unauthorized, or defective mobile stations.

a) EIR	b) HLR	c) AUC

13. PLMN is an area covered by

a) MSC	b) BSC	c) BTS

14. Location Area is an area covered by

a) MSC	b) BSC	c) Operator

15. ....uniquely identifies the mobile equipment.

| a) IMSI | b) MSISDN | c) IMEI |

16. In PGSM, The separation between uplink and downlink frequencies is   .

| a) 45MHz | b) 45kHz | c) 25kHz |

17. Which area of the world first deployed cellular services for commercial use?

| a) Scandinavia | b) Central America | c) Western Africa |

18. The first cellular systems were

| a) analog | b) semi analog | c) digital |

19. The location area is the area in which a   can be paged.

| a) subscriber | b) BTS | c) tower |

20. The .... is a database used for storing and managing subscriptions.

| a) EIR | b) HLR | c) AUC |

21.The ....provides authentication and encryption parameters.

| a) EIR | b) HLR | c) AUC |

22. The PLMN service area is an area served by .... network operator.

| a) One | b) four | c) various |

23. Which of this is the interface between MS & BTS?

| a) Um | b) A | c) Abis |

24. RAND is a random 128 bit number that is generated by

| a) AUC | b) MS | c) VLR |

25. Ki is the individual subscriber key that is paired with an.......... when the.............is created

| a) IMSI-MS | b) IMSI-SIM | c) IMEI-ME |

26 ...., ... and ....are used to compute SRES.

| a) A5,RAND, Ki | b) A8,Kc, RAND | c) A3, Ki, RAND |

27. EIR is a database that stores

| a) IMSI | b) IMEI | c) MSISDN |

28. Kc is a 64 bit ....key that is generated by .... and used in the ....encryption algorithm

| a) ciphering, A3, A5 | b) authentication, A3, A5 | c) ciphering, A8, A5 |

29. BCCH is always transmitted on full power and it.........

| a) Downlink channel | b) Uplink channel | c) Both way channel |

30.Which of this is used in down-link direction for sending paging message to MS

| a) RACH | b) PCH | c) BCCH |

31. When MS requests access to the network, MSC will forward .... to HLR and request ....

| a) IMSI-Triplet | b) Ki-SRES | c) IMSI-KC |

32. Which channel is used to transmit random access signals?

| a) BCCH | b) CCCH | c) SDCCH |

33. Triplet is composed of ....

| a) Ki, RAND, Kc | b) Ki, SRES, Kc | c) RAND, SRES, Kc |

34. Time Duration of TDMA Frame in GSM?

| a) 120ms | b) 4.615ms | c)235.4ms |

35. In GSM, if the uplink bandwidth is 4 MHz, the maximum number of channels?

| a) 25 | b) 20 | c)30 |

36. ....is a system of long-distance communication and based on towers with moving arms.

| a) Semaphore system | b) Radio system | C) Optical system |

37. Forward radio channel used for call setup, call request, and call initiation is

| a) Control channel from MS to BTS | b) Control channel from BTS to MS | c) Traffic channel from BTS to MS |

38. Reverse radio channel is used to transmit/receive information

| a) Downlink traffic channel | b) Downlink control channel | c) Uplink traffic channel |

39. Deviation of some aspects (Amplitude, Phase, and etc.)of the pulses in the high frequency signal is

| a) Jitter | b) Time advance | c) Fading |

40. ....Divides the total frequency bandwidth into sub channels

| a)TDMA | b) FDMA | c) CDMA |

41. Sky waves are

| a)Reflected by ionosphere layer | b) ranging from 1kHz to 30MHz | c) Both a and b |

42. Far field distance for a BTS antenna with largest dimension D=0.5m at frequency 900MHz

| a) 1.5 cm | b) 1.5 m | c) 1.5 km |

43. The blocked calls cleared trunked system offers.......for call request that has no available channel

| a) no queuing | b) a delay | c) borrowing strategy |

44. BTS radiates 10W at 900MHz with Gt=2, if a MS at distance of 5km with G_r=1 will receive

| a)-92.6dBm | b) -62.6dBm | c) -81.6dBm |

45. ARFCN 70 for PGSM is

| a) [up=904,down= 949] MHz | b) [down=904,up= 949] MHz | c) [up=904,down 929] MHz |

46. Sectoring is a technique which

| a) can increase the SIR | b) uses several directional antenna | c) (a) and (b) |

47. When the cell radius is reduced by factor 2 the BTS transmitted power must be reduced by a ....

| a) 12 dB in dense urban areas | b) 9 dB in suburban areas | c) (a) and (b) |

48. With 120° sectored cells, MS receive co-channel interference from only .... of the first tier.

| a) One co-channel cells | b) Two co-channel cells | c) Three co-channel cells |

49. In PGSM, each BTS will have between ......Transceivers. Each one represents one............

| a) 1-10, CGI | b) 1-9, LAI | c) 1-16, ARFCN |

50. The time over which a call may be maintained within a cell, without handoff is ....

| a) Dwell time | b) Holding time | c)Setup time |

51. In first generation analog cellular systems, signal strength measurements are made by

| a) MS | b) BTS | c)MSC |

52. In second generation systems, signal strength measurements are made by

| a) MS | b) BTS | c)MSC |

53. A fraction of the total available channels in a cell is reserved exclusively for handoff requests

| a) Guard channel handoff | b) Queuing of handoff | c) None of the above |

54. MAHO is particularly suited for .... environments

| a) Micro-cellular | b) macro-cellular | c) None of the above |

55. ....becomes necessary if a MS moves from one PLMN to a different PLMN.

| a) Intersystem handoff | b) Soft handoff | c) Softer handoff |

56. Number of square cells (radius = 0.5 km) required to cove a square area of $9km^2$ is.........

| a) Thirteen cell | b) Thirty six cell | c) Eighteen cell |

57. Channel spacing in PGSM is ....

| a) 125 KHz | b) 150 KHz | c) 200 KHz |

58. Number of uplink physical channels in PGSM are ....

| a) 125 | b) 1000 | c) 250 |

59. The terminal connectivity in cordless phones is

| a) Simplex | b) Half duplex | c) Full duplex |

60. Number of hexagonal cells/cluster if the desired S/I=15dB, path-loss exponent=4

| a) 7 | b)3 | c) 12 |

61. The number of hexagonal cells/cluster .... if path-loss exponent increases for constant S/I.

| a) increases | b) decreases | c) un changed |

62. Load of one Erlang represents a channel that kept for ....

| a) Sixty minutes | b) Thirty minutes | c) Fifteen minutes |

63. Hand off strategy in NMT450 is ….. ………………

a) hard handoff	b) soft handoff	c) softer hand off

64. Hand off strategy in UMTS is ….. ………………

a) hard handoff	b) soft handoff	c) softer hand off

65. In microcell zone concept, cell is divided into microcell zones, each of them is connected to…..

a) shared radio equipment	b) different radio equipment	c) shared antenna

66. Handoffs in microcell zoning systems are …………………handoffs in sectored system.

a) more than	b) less than	c) equal

67. ………..are Bidirectional radio transmitters that can be used in coverage for hard-to-reach areas.

a) Repeaters	b) Zone selectors	c) Towers

68. The acceptable voice quality at the base station receiver normally taken as ………………

a) -90 dB and -100 dB	b) -90 dBm and -100 dBm	c) -9 dBm and -10 dBm

69. …………….strategies require the MSC to collect real-time data on channel occupancy.

a) Dynamic channel assignment	b) Fixed channel assignment	c) (a) and (b)

70. Cellular systems permit a base station to be positioned up to ……away from the ideal location

a) one-fourth the cell radius	b) one-third the cell radius	c) one-fifth the cell radius

Q2. Use CDMA technique with the orthogonal codes (1, 1) and (1, -1) to send and receive the following two groups of data (1 0 1 1) and (0 0 1 1).   [5 marks]

Q3. A dense urban area of **864 square meter** and is covered by a cellular system using a **12-cell reuse** pattern. Each **square cell** has a radius of **6 meter** and the city is allocated **24 MHz** of spectrum with a **full duplex** channel bandwidth of **40 kHz**. Assume a GOS of **2%** for an Erlang B system is specified. If the offered traffic per user is **0.04 Erlangs**, compute (a) the number of cells in the service area, (b) the number of clusters in the service area. (c) the number of channels per cell, (d) traffic intensity of each cell, (e) the maximum carried traffic, (f) the total number of users that can be served for 2% GOS, (g) the number of mobiles per unique channel (h) the theoretical maximum number of users that could be served at one time by the system, (i) S/I in dB of the co-channel interference, and (j) the efficiency of the system, (k) If P_r is assumed to be 5w at 1Km from the BTS, what is the maximum cell size?

Under the following conditions: a) Un-sectored system   b) 90° sectoring   [25 marks]

How much the enhancement (%) in the capacity if the radius of the half of cells is reduced by factor **2**?

Good Luck...

Dr. Nihal Favez

N/B	0.01	0.05	0.1	0.5	1.0	2	5	10	15	20	30	40
11	2.722	3.329	3.651	4.610	5.160	5.842	7.076	8.487	9.691	10.86	13.33	16.31
12	3.207	3.878	4.231	5.279	5.876	6.615	7.950	9.474	10.78	12.04	14.72	17.95
13	3.713	4.447	4.831	5.964	6.607	7.402	8.835	10.47	11.87	13.22	16.11	19.60
14	4.239	5.032	5.446	6.663	7.352	8.200	9.730	11.47	12.97	14.41	17.50	21.24
15	4.781	5.634	6.077	7.376	8.108	9.010	10.63	12.48	14.07	15.61	18.90	22.89
46	25.83	28.11	29.26	32.52	34.32	36.53	40.55	45.24	49.40	53.56	62.77	74.33
47	26.59	28.90	30.07	33.38	35.22	37.46	41.54	46.32	50.56	54.80	64.19	76.00
48	27.34	29.70	30.88	34.25	36.11	38.39	42.54	47.40	51.71	56.03	65.61	77.66
49	28.10	30.49	31.69	35.11	37.00	39.32	43.53	48.48	52.87	57.27	67.04	79.32
50	28.87	31.29	32.51	35.98	37.90	40.26	44.53	49.56	54.03	58.51	68.46	80.99

Please, Put your answer of Q1 in the shown table and Put this page in your answer booklet.

	A	B	C
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			

	A	B	C
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			