

- N.B. :** (1) Question No. 1 is **compulsory**.  
 (2) Answer any **four** questions out of remaining **six** questions.  
 (3) Assume **suitable** data wherever **necessary** and justify.

1. Answer any **four** of the following :-

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- What is Doppler Shift ? Explain. State its effect on bandwidth.
- Differentiate between AMPS and ETACS systems.
- Give the radio specifications for CT2 standard.
- An AMPS system is allocated 50 MHz of spectrum in the 800 MHz range and provides 832 channels. 42 of these channels are control channels. The forward channel is 45 MHz greater than the reverse channel frequency :
  - Is the AMPS system Simplex, half-duplex or duplex ? What is the bandwidth for each channel and how is it distributed between the base station and subscriber ?
  - Assume a base station transmits control information on channel 352, operating at 880.560 MHz. What is the transmission frequency of a subscriber unit transmitting on channel ?
- Explain the advantages and disadvantages of the two-ray ground reflection in the analysis of path loss. In the following cases tell whether the two ray model could be applied and explain why or why not ?
 

ht = 35 m, hr = 3 m, d = 250 m

ht = 30 m, hr = 1.5 m, d = 450 m.

- Explain the supervisory signals and wide-band blank and burst encoding in an AMPS system. 10
  - Prove that in the two-ray ground reflection model  $\Delta = d'' - d' = (2 \text{ ht hr})/d$ . Show when this hold a good approximation. 10
- Explain in detail how a physical channel is constituted in GSM for forward and reverse link and hence explain channel classification for GSM. 10
  - A cellular system is required to design for the city with 1200 sq. km area. A hexagonal cellular system with 7 cell re-use and a radius of 1,387 km is to be used. 12.5 MHz of spectrum each in forward and reverse channel is allocated with 25 KHz of one simplex channel BW. If the load per user is 0.029 Erlangs and  $\lambda = 1$  call/hour. Compute the following for the Erlang C system that has 5% probability of delayed call : 10
    - What maximum number of customers can be supported in system ?
    - How many customers/sq. km will this system support ?
    - What is the probability that a delayed call will have to wait for more than 10 sec. ?
    - What is the probability that a call will be delayed for more than 10 Sec ?

## Erlang C Traffic Table

GOS in % →

C*	0.01	0.05	0.1	0.5	1.0	2	5	10	15	20	30	40
66	39.89	42.39	43.58	46.74	48.30	50.03	52.64	54.92	56.42	57.57	59.34	60.72
67	40.66	43.18	44.39	41.58	49.16	50.90	53.53	55.83	57.34	58.50	60.29	61.68
68	41.44	43.98	45.20	48.42	50.01	51.77	54.42	56.75	58.27	59.44	61.24	62.64
69	42.21	44.78	46.02	49.26	50.87	52.65	55.32	57.66	59.20	60.37	62.19	63.60
70	42.99	45.58	46.83	50.10	51.73	53.52	56.21	58.57	60.12	61.31	63.14	64.56
71	43.77	46.39	47.64	50.95	52.59	54.39	57.11	59.49	61.05	62.25	64.09	65.52
72	44.55	47.19	48.46	51.79	53.45	55.27	58.01	60.41	61.98	63.18	65.04	66.48
73	45.33	48.00	49.28	52.64	54.31	56.14	58.90	61.32	62.91	64.12	65.99	67.44
74	46.11	48.81	50.10	53.49	55.17	57.02	59.80	62.24	63.84	65.06	66.94	68.40
75	46.90	49.61	50.92	54.34	56.03	57.90	60.70	63.16	64.76	66.00	67.89	69.37

\* C- number of channels/cell

4. (a) For CDMA, give radio interface specifications stating forward and reverse frequency spectrum, channel bandwidth. Explain how Walsh function Matrix is generated to provide 64 channels on one forward link. How the Orthogonality among them is checked? Why orthogonality is preserved? Classify them and state their functions. **10**
- (b) Using the time dispersive and time varying nature of channel explain the following terms: **10**
- Mean excess delay,
  - Rms delay spread,
  - Excess delay spread,
  - Coherence Band Width,
  - Coherence time.
5. (a) Determine the maximum and minimum spectral frequencies received from a stationary GSM transmitter that has a central frequency of exactly 1950 MHz assuming that the receiver is traveling at the speeds of **10**
- 1 km/hr
  - 5km/hr
  - 100 km/hr
  - 1000 km/hr.
- (b) Draw a neat block diagram for signal processing in GSM and hence explain. **10**
6. (a) For reverse CDMA channel explain the variable data rate transmission with the help of data randomizer algorithm. **10**
- (b) Differentiate between GSM and CDMA and justify them with respect to the following parameters: **10**
- Cellular architecture
  - Frequency planning
  - Hand-off Strategies
  - Maximum capacity
  - Quality of service
  - Security.
7. Write short notes on any **four** of the following :- **20**
- Capacity improvement in cellular system.
  - GPRS
  - GSM frame structure
  - Small scale fading
  - Long PN sequence used for data scrambling in CDMA.