Code: AE17/AT17   **Subject: TELECOMMUNICATION SYSTEMS**
Time: 3 Hours   **Max. Marks: 100**

DECEMBER 2008

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1   **Choose the correct or best alternative in the following:**   **(2x10)**

a.   Which of the following switching systems use step by step systems

   (A) Electronic switching   **(B)** Analog switching
   (C) Strowger switching   **(D)** Space switching

b.   For a non folded network to be non blocking should support

   (A) 2N simultaneous switching paths.

   (B) N^2 simultaneous switching paths.

   (C) N simultaneous switching paths.

   (D) $N/2$ simultaneous switching paths.

c.   Which of the following protocols with in ISDN are critical to providing backbone network connectivity between MSC's throughout the world.

   (A) Digital subscriber system number 1.
   (B) Advanced radio data information systems.
   (C) Common channel signalling.
   (D) SS7 protocol.

d.   The baud rate and the bit rate for n number of bits required to represent signal levels are related as

   (A) Bit rate = 2n × Baud rate.   **(B)** Bit rate = n × Baud rate.

   (C) Bit rate = $\frac{n}{2}×$ Baud rate.   **(D)** none of the above.

e.   Which of the following statements is correct about Microcom Networking Protocol (MNP)

   (A) MNP conforms to transport layer of ISO-OSI reference model.
   (B) There are six classes of MNP protocols.
   (C) MNP conforms to data link layer of ISO-OSI reference model.

(D) There are only two classes of MNP protocols.

f. If M is mean number of customers in the system and ρ is traffic intensity then both are related as

(A) $M = \dfrac{2\rho}{1-\rho}$ **(B)** $M = \dfrac{2\rho}{2-\rho}$

(C) $M = \dfrac{\rho}{1-2\rho}$ **(D)** $M = \dfrac{\rho}{1-\rho}$

g. The bit rate for unipolar return-to-zero coding (UPRZ) and unipolar non return-to-zero coding (UPNRZ) are related as

(A) $B_{NRZ} = \dfrac{B_{RZ}}{2}$ **(B)** $B_{NRZ} = \dfrac{B_{RZ}}{4}$

(C) $B_{NRZ} = 2B_{RZ}$ **(D)** $B_{NRZ} = 4B_{RZ}$

h. Which type of modulation technique is used in GSM

(A) PSK   **(B)** ASK
(C) MSK   **(D)** GMSK

i. For a cell with radius R. If frequency reuse factor is 12 then frequency reuse distance is given as

(A) 3R   **(B)** 6R

(C) $R/12$ **(D)** 12R

j. Traffic unit CCS gives

(A) Calls completed in 100 sec
(B) Century of call seconds
(C) Century of call seconds per hour
(D) Calls completed per second

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Differentiate between space division switching and time division switching. **(10)**

    b. Calculate the number of trunks that can be supported on a time multiplexed space switch, given that

(i)   32 channels are multiplexed in each stream.
(ii) Control memory access time is 100 ns.
   (iii) Bus switching and transfer time is 100 ns per transfer.   **(2+2+2 = 6)**

Q.3   a.   Explain following transmission impairments
   (i)   Attenuation   (ii) Distortion
   (iii) Interference   (iv) Echoes
   (v)   Crosstalk   **(5 × 2 = 10)**

   b.   An exchange uses a 40V battery to drive subscriber lines. A resistance of $250\ \Omega$ is placed in series with the battery to protect it from short circuits. The subscribers are required to use a standard telephone set which offers a d.c. resistance of $50\,\Omega$. The microphone requires 23 mA for proper functioning. Determine the farthest distance from the exchange at which a subscriber can be located if 26 AWG conductor is used? Given that for this conductor D.C. resistance is $133.89\,\Omega/\mathrm{Km}$?   **(6)**

Q.4   a.   Explain following with reference to telecommunication traffic

   (i)   Busy hour.   (ii) Flow control.
   (iii) Traffic intensity.   (iv) Erlang.
   (v)   Queuing model.   **(5 × 2 = 10)**

   b.   A Public Call Office (PCO) is installed in a busy part of a town. 150 persons use the booth everyday. The average holding time for a call is 1.5 minutes. There is a suggestion from the public that another PCO is required in the same locality as the wait times are unduly long. Analyse the situation us M/M/1 queue and determine if the suggestion deserves serious consideration.   **(6)**

Q.5   a.   Given a cellular system with a total bandwidth of 30 MHz which uses two 25 KHz simplex channels to provide full duplex voice and control channels. Assuming that the system uses a nine-cell reuse pattern and   1 MHZ of total bandwidth is allocated for control channels. Calculate

   (i)   the total available channels.
   (ii)   the number of control channels.
   (iii) the number of voice channels per cell.
   (iv)   an equitable distribution of control and voice channels
        in each cell.   **(4 × 2 = 8)**

   b.   Explain the architecture of GSM.   **(8)**

Q.6   a.   Write short note on SONET/SDH.   **(8)**

   b.   Define the range of frequencies and wavelength that are suitable for fibre optic transmission.

Why cladding is necessary for light to propagate along the fibre? **(8)**

Q.7   a.   Explain various services of ISDN. What makes ISDN signalling flexible?   **(10)**

    b.   What is the rational behind specifying different functional groupings and interfaces in ISDN? Would you think that U interface may be relevant in India? Why?
    (6)

Q.8   a.   Differentiate between packet switching and circuit switching with examples.   **(6)**

    b.   State with reasons which of the seven layers of the OSI reference model will play a role in the following circumstances.   **(5 × 2 = 10)**

    (i)   A user with a line mode terminal wants to communicate with a user having screen mode terminal.
    (ii)   A user wants to acquire real time data from a remote site.
    (iii)   A user would like to use a preferred path for communications.
    (iv)   Traffic through a particular node is excessive and congestion occurs in that part of the network.
    (v)   A network offers secure communication facility.

Q.9   Write short notes on:-

    (i)   Wavelength Division Multiplexing (WDM)
    (ii)   Digital subscriber loop (DSL).
    (iii)   Cellular power control and Handoff techniques.
    (iv)   BORSCHT.   **(4+4+4+4 = 16)**