AMIETE – ET/IT (OLD SCHEME)

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

DECEMBER 2009

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 the best alternative in the following: **(2×10)**

a. In a group of 10 servers, each is occupied for 30 minutes in an observation interval of two hours. The traffic carried by the group is

(A) 2.5 E **(B)** 25 E
(C) 0.25 E **(D)** 0.025 E

b. An exchange serves 2000 subscribers. If the average busy hour call attempts is 10,000 and call completion rate is 60%, the busy hour calling rate is

(A) 1 **(B)** 2
(C) 3 **(D)** 4

c Refer information given below:

Versions of DSL		Characteristics	
a	ADSL	1	T_1 / E_1 service on two pairs
b	HDSL	2	T_1 / E_1 service on one pair
c	SDSL	3	52 Mbps downstream, 2.3 Mbps upstream
d	VDSL	4	9 Mbps downstream, 640 Kbps upstream

Which of the following is true?

	a	b	c	d
(A)	2	3	1	4
(B)	4	1	2	3
(C)	3	2	4	1
(D)	1	4	3	2

d. The shape of the cell in cellular mobile system is

(A) Pentagon **(B)** Hexagon
(C) Circle **(D)** Square

e. E1 line corresponds to

(A) 1.554 Mbps **(B)** 64 Kbps
(C) 2. 048 Mbps **(D)** 128 Kbps

f. GSM employs

(A) FDMA **(B)** CDMA
(C) TDMA **(D)** both FDMA and TDMA

g. The typical value of S/N in telephone systems is

(A) 30 dB **(B)** 40 dB
(C) 10 dB **(D)** 20 dB

h. 10 dBm corresponds to

(A) 10 dB **(B)** 20 dB
(C) 0 dB **(D)** - 20 dB

i. Long distance calls in conventional analog telephone system require 2 wire to 4 wire connection at the subscriber line trunk interfaces because

(A) The traffic is more between trunk lines
(B) Amplifiers (or repeaters) are required at appropriate intervals
(C) Telephone system is a simplex system
(D) The other pair cable in a trunk line acts like a standby line

j. Refer information given below:

Service Provider Layers		Service User Layers	
a.	Physical Layer	1.	Transport Layer
b.	Network Layer	2.	Application Layer
c.	Session Layer	3.	Data link Layer
d.	Presentation Layer	4.	Presentation Layer

Which among the following is correct?

	a	b	c	d
(A)	3	1	4	2
(B)	1	2	3	4
(C)	2	1	4	3
(D)	2	4	3	1

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

Q.2 a. Compare Single stage network and Multi stage network. **(10)**

b. Does a two stage non blocking network offer any advantage over a single stage non blocking network? Why? **(6)**

(6)

Q.3 a. Determine the implementation complexity of a 131,072- channel TSSST switch designed to provide a maximum blocking probability of 0.002 under channel occupancies of 0.7. Assume the switch services 1024 TDM input links with 128 channels on each link. Also assume that unity time expansion is used on the space stages.
(10)

b. A TASI system has 10 channels and 20 sources connected to it. What is the probability of clipping, if the activity factor for each source is 0.4?
(6)

Q.4 a. In a national transmission system, the characteristic impedances of the 4-wire circuit and the 2-wire circuit are 1000 Ω and 1200 Ω respectively. The average phase velocity of the signal in the circuit is 3×10^7 m/s. If the largest distance of a connection is 300 km, determine the attenuation to be inserted in the circuit. **(4)**

b. What is BORSCHT? **(6)**

c. What do you understand by lost call delayed systems? **(6)**

Q.5 a. Draw the core structure for Mobile communication. Explain the basic operation of cellular mobile telephony. **(12)**

b. Determine the probability of maximum interference of a 64-channel CDMA system with 64-bit spreading codes. Also determine the effective signal-to-interference power ratio of the same CDMA system. Assume all channels operate at the same effective power level at the receiver and that all channel codes have 3 cross correlation of ±1 bit.
(4)

Q.6 a. What are the advantages of fiber optic transmission systems? Explain each one of them clearly.
(10)

b. Determine the system gain, the BDP, the dispersion-limited repeater spacing and the loss margin for an FOT system with the following parameters: data rate = 565 Mbps, line code = 5B6B RZ, wavelength = 1550 nm, source = -5 dBm DFB-LD with a 0.4 nm FWHM, fiber = SMF, detector = InGaAs APD, repeater spacing = 65 km, and splicing losses = 0.2 dB/km. Assume that the receiver sensitivity for 678 MBps is -34.5 dBm.
(6)

Q.7 a. Explain the following terms:-
(i) Grade of service.
(ii) Quality of service.
(iii) Erlang. **(6)**

b. What are the basic differences between voice and data traffic? **(6)**

c. Distinguish connection oriented service from connectionless service. **(4)**

Q.8 Write short notes on the following:
(i) Switching systems
(ii) SONET/SDH
(iii) Compare LCR and LCH models
(iv) Data Communication Architecture. **(2+4+4+6)**

Q.9 a. Describe ADSL. Explain its Discrete Multi Tone (DMT) implementation with block diagram. **(13)**

b. A circuit switched connection involves 5 switching nodes. Each node takes 2 seconds and 0.2 second for establishing and releasing connections respectively. If the data transfer rate is 2400 bps, compute the data transfer time for a message that is 300 bytes long. **(3)**