

Code: A-17 / T-17**Subject: TELECOMMUNICATION SYSTEMS****Time: 3 Hours****June 2006****Max.****Marks: 100****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. At a certain point in a system, the signal power is 18 mW and the noise power is zero dBm. At this point, the signal-to-noise ratio is
- (A) 18. (B) 36.
(C) 18 dB. (D) 36 dB.
- b. The traffic unit ERLANG equals
- (A) 3600 CCS. (B) 100 CCS.
(C) 60 CCS. (D) 36 CCS.
- c. In a call office, there are 30 calls per hour and the average holding time is 200 sec. The corresponding traffic is
- (A) 0.083 E. (B) 0.5 E.
(C) 1.67 E. (D) 30 E.
- d. In ISDN networks, the speed of the H_0 channel is
- (A) 1536 kbps. (B) 384 kbps.
(C) 64 kbps. (D) 16 kbps.
- e. Consider 12 number of phones in a system with switching at the stations. The required number of switches will be
- (A) 132. (B) 66.
(C) 23. (D) 12.
- f. In mB1P bit insertion code, the bit to be inserted after m bits

- (A) is a 1. (B) is a 0.
 (C) should lead to an even parity. (D) should lead to an odd parity.

g. The common channel signalling in ISDN is done over the

- (A) B channel. (B) D channel.
 (C) H_{11} channel. (D) H_{12} channel.

h. The abbreviation POTS stands for

- (A) Plain Old Telephone Service.
 (B) Private Owned Telephone System.
 (C) Private Operated Trunk Service.
 (D) Primitive Order Telecom Service.

i. The number of overhead bytes in a 53 byte cell in ATM transmission is

- (A) 1. (B) 3.
 (C) 5. (D) 7.

j. The number of different amplitudes employed by a 16-ary QAM signal system is

- (A) 3. (B) 4.
 (C) 5. (D) 6.

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

Q.2 a. Describe two-stage switching networks. Find out the blocking probability, in general. Also find the minimum number of switching elements for blocking and non-blocking configurations using square switching matrices. (8)

b. In a certain switching system, over a six hour slot, 216 calls are received. A call lasts 200 sec on an average. Find the grade of service if six servers are used. On an average, how many servers will remain idle? (8)

Q.3 a. A system receives 40 calls per hour and the average call holding time is 3 minutes. Find the probability that no call is received in a five minute interval. Also find the blocking probability and the traffic carried by the first five trunks assuming that the calls are routed to the first trunk, if it is free, otherwise to the second trunk, and so on. (8)

- b. A three-stage switching structure is to accommodate 128 input and 128 output terminals. There are to be 16 first stage and 16 third stage matrices.
- (i) How many cross points are required if the system is to be non-blocking?
 - (ii) It is known that at the peak traffic periods, the utilization probability is 10%. Find the probability of blocking if the number of cross points is now reduced by a factor of 3 below the number required to avoid blocking. **(8)**

Q.4 a. Analyse a delay system (or a lost call delay i.e., LCD system) to obtain expressions for the probability of unspecified delay. Also derive expressions for the probability of delay beyond a specified value and also for average waiting time. **(8)**

- b. A PCO is visited by 200 customers everyday. The average holding time is 3 minutes. Treating it to be an M/M/1 queue, find the probability of delay. Also find the average waiting time. **(8)**

Q.5 a. Explain time multiplexed time switching. **(8)**

- b. Determine the design parameters of a three stage space division switch with 128 inlets and 128 outlets and 0.002 blocking probability. Use square switching matrices in the first and third stages and minimum number of switches. Determine the inlet utilization. **(8)**

Q.6 a. Describe the global system for mobile communications (GSM), explaining the GSM channel coding and modulation. **(8)**

- b. Find the number of trunks that can be supported in a time multiplexed space switch when 16 channels are multiplexed in each stream. The control time is 90 ns and the bus switching and transfer time is 60 ns. How can you increase the number of trunks that can be supported? **(8)**

Q.7 a. Describe the ISDN basic rate architecture, giving a suitable diagram and explaining the function of each block. **(8)**

- b. Calculate the maximum time that can be available for the data and control memories in a TSI switch with a single input and single output trunk multiplexing 2000 channels. Also, give an estimate of the cost of the switch and compare it with that of a single stage space switch. **(8)**

Q.8 a. Describe Asymmetrical Digital Subscriber Line (ADSL), explaining its DMT implementation with the help of a block diagram. **(8)**

- b. A packet switching node operates with fixed length packets of 240 bits on 9600 bps lines. If the link utilization is to be 80%, what will be the average delay through a node? How will the average delay change if the offered load goes up by 20%? **(8)**

Q.9 Write notes on any **TWO** of the following:

- (i) Optical Sources and Detectors for Optical Fibre Communication.
- (ii) Time and Space Combination Switching.
- (iii) M-ary Signals.

(2 x 8)