Q2. a. Draw the schematic of a 1000 line strowger switching system and explain how subscribers get connected.

Ans: (Page: 61 of Text book 1 and 56 of Text book 2)

b. Explain the various design parameters of a switching system.

Ans: (Page: 46-48 Text book 2)

c. What are the advantages of a digital system over electromechanical system?

Ans: Explanation of:

1. Electromechanical switches are slow compared to Electronic switches.
2. Electromechanical systems are less reliable than electronic systems.
3. Electromechanical systems cannot be programmed.
4. Electromechanical systems do not have any memory and queuing is not effective.
5. Limited number of subscribers compared to electronic digital systems.
6. No additional facilities/services can be provided in electromechanical systems.

Q3. a. What is the need to estimate the traffic in an exchange, how is it arrived at?

Ans: Explanation of

1. Number of calls in progress is a random event.
2. Averaging during various hours is essential.
3. In designing an exchange it is necessary to consider the area in which exchange is to be located as the number of calls depend on the users in that area.
4. The number of trunks to be provided depends on the Traffic at various times in different exchanges.

The traffic is estimated by arriving at average number of calls and the average duration. The unit of traffic in Erlangs is arrived at; $A=(Ch/T)$ where C is the average calls arrival during time T and h is the average hold time. Since a trunk cannot handle more than one call at a time $A<1$. In order to provide good service Grade of service also needs to be calculated for a given exchange.

B= (Number of calls lost)/ Number of calls offered)

(Pages 87-92 of Text book 1)

b. A switching system serves 10000 subscribers with a traffic intensity of 0.2 Erlangs per subscriber. If the traffic increases by 40%, what is the effect on the arrival rate?

Ans: Normal Traffic: 10000 * 0.2 = 2000
Number of available subscribers to generate new traffic = 10000 – 2000 = 8000
Increase in traffic = 2000 * 1.4 = 2800
Number available after increase = 7200
Change in arrival rate = (8000 – 7200)/ 8000 = 0.1 or 10%

c. What are the assumptions taken into account while arriving at a queuing system? Explain the need of finite Queuing and how this capacity is arrived at.

Ans: Assumptions made:
Pure Chance traffic, Statistical equilibrium, Full availability, Calls which encounter congestion are put in a queue.
During congestion it is not possible to keep subscribers in queue for infinite duration of time. This will reduce the grade of service and require large memory. Also it is not practicable, hence it is necessary that the queuing period is limited or is finite. Thus when the queue has become full the call is lost.
Queuing capacity is found from acceptable call loss probability.
$P(x>= Q+N) = (A/N)^Q P_D$

Q4. a. Define the following:

i. Traffic capacity

Ans: (Page: 121 of Text book 1)

ii. Grade of service

Ans: (Page: 138 of Text book 1)

iii. Non Blocking network

Ans: (Page: 169 of Text book 1)

b. Draw the schematic of a two stage network and explain its operation in providing reliable switching.

Ans: (Page: 129 of Text book 1)

c. Design a three stage network that has 100 incoming line and 300 outgoing trucks. Also calculate the total cross points.

Ans: M=100 N=300 therefore
m= 100/ (100 + 300) = 5
n= 300/ (100 + 300) = 15
Thus 15 primary switches of size 5X5 are required
5 secondary switches of size 15X15 are required
15 tertiary switches of size 5X15 are required

No. of cross points will be = 2X100 (100+300) = 4000

Q5.a. Distinguish between Time division space switching and Space division space switching.

Ans: (Page: 158-164 of Text book 1)

Time division space switching also called Time space (T-S-T) switching network m incoming and m outgoing PCM lines connected to time switch. The incoming and outgoing time switches are interfaced with space switch. Thus the input signal time a lot is coverted into y time slot before it is transmitted to output at time slot Z.

Space division time switch (S-T-S) has m incoming PCM lines that are connected to k links by cross points in A time switch, while outgoing m lines are connected to cross point time switch B. The connection is completed by operating appropriate A switch cross point at time X and the appropriate B switch cross point in time Y in each frame.

b. What are synchronization networks? Draw schematic of synchronization hierarchy of an integrated digital networks.

Ans: These networks have common clock that controls the whole network exchanges. PSTNs are connected to a synchronizing network. Thus all PSTNs come under a common National reference standard. A crystal clock in each exchange is voltage controlled by a digital stream received on synchronization link. Synchronization links may be unilateral or bilateral. In order to take care of delays due to variable path lengths phase shifts need to be arrived at and corrected.

There is a particular hierarchy to be followed in all IDNs as shown, which is also repeated in PSTN

(Figure on page 173 of Textbook 1)

c. What is the role of concentrators in a switching network?

Ans: Concentrator connects to a PCM highway a number of subscribers line units,
(Pages 164-166 of Textbook 1)

Q6. a. How call processing takes place in a switching system? Explain with example.

Ans: Pages 177-180 of Text book 1

b. What is store program control? Give the organization of centralized SPC. Discuss the advantages of SPC automation in telephone switching?

Ans: In modern exchanges computers execute all control functions. These are in the memory and are executed as and when required. There are generally two servers either cold standby or hot standby to improve the reliability. This not only atomizes the exchange but also provides additional services like Common channel signaling, centralized maintenance, fault diagnosis, voice activated services etc.

(Pages 193-195 of Textbook 1 & Textbook 2)

c. What are application programs that run on an operating system?

Ans: Page 197 of Text book 1

Q7. a. What are the various types of signaling used in a switching network?

Ans: Signaling facilities in Call request, Address signals, Answer and Clear line. For this various signaling are required: Explanation of –Line signaling, outband signaling, In- band signaling that takes care of Tone on idle condition and Pulse signaling, PCM signaling, Inter register signaling and common channel signaling.

(Pages 205-218 of Textbook 1)

b. Explain the various levels of CCITT signalling system number 7.

Ans: SS7 has 4 significant layers; these are derived from the ISO-OSI reference 7 layer model. The four layers are: The Physical level, Data link level, Signalling network level and User part.

(Pages 221-222 of Textbook 1)

c. Describe High level Data link control protocol.

Ans: High level link protocol is used in CCITT-7. Messages are sent by packets using a frame having flag, Address, Control, Information, Checksum and Flag. The frame contains total of 64 bits of overheads and remaining is information transmitted at 32Kbps

(Page 223 of Textbook 1)

Q8. a. How frame relay is different from X25 packet switching?

Ans: (Article: 9.4.6, Page no. 245 of Textbook 1)

b. What are the various network topologies? Compare the ring configuration with bus configuration.

Ans: Topologies: Bus and Ring
Bus network can be more reliable than ring.
Additional nodes can be connected.
A bus network uses twisted pair.
Bus network suffers from reflection and impedance matching is required.
Fault isolation is difficult in Bus networks; it is easy in ring network.

(Page No. 235-239 of Textbook 1).

c. Explain the features of ATM and explain the principle of an ATM switch.

Ans: Features: Packets are of fixed length unlike synchronous switching systems.
It works on a virtual network and if resource is not available call is rejected.
No error control or flow control is provided.
Header is short and identifies the virtual connection and sequence number.
Shorter packets minimize packeting delay.

(Pages 247-248 of Textbook 1)

Q9. Write short notes on:

i. Numbering Plans for the ISDN Era

Ans: (Page no. 263 of Textbook 1)

ii. PDN

Ans: (Page no. 272 of Textbook 1)

iii. Numbering Plan

Ans: (Page no. 273 of Textbook 1)

iv. Automatic Alternate Routing

Ans: (Page no. 283 of Textbook 1)

TEXTBOOKS

1. Telecommunication Switching, Traffic and Networks; J. E. Flood, Pearson Education – 2006

2. Telecommunication Switching Systems and Networks, Thiagarajan Viswanathan, Prentice Hall of India Pvt. Ltd., 2007