



The Open University of Sri Lanka
Department of Electrical & Computer Engineering
Final Examination - 2005/2006
ECD1206/ECE3206 – Telecommunication Switching Principles

Time : 09.30 - 12.30

Date : 25 - 04 - 2006

Answer any 5 questions.

1. (a) Explain the following terms.
 - (i) Local Exchange
 - (ii) Trunk Exchange
 - (iii) Transit Exchange

(06 marks)
 - (b) Explain why a large city has several telephone exchanges. instead of a single large one. What type of exchange are you using to interconnect these multiple exchanges?

(02 marks)
 - (c) Consider a telephone call which is made between A and B who are belonged to the same telecommunication service provider. Indicate the routing path for the following cases.
 - (i) If A and B are in the same local area.
 - (ii) If A and B are in different local areas but in the same secondary switching center area.
 - (iii) If A and B are in different local areas and in different secondary switching center areas.

(09 marks)
 - (d) Suppose A is making a telephone call to another subscriber C, who is belonged to a mobile telephone company. Then what will be the routing path ? (Include the path within the mobile network as well.)

(03 marks)
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2. (a) With the help of a diagram, explain the principle of operation of a Two Wire to Four Wire hybrid circuit.

(05 marks)
 - (c) What are the possible signaling tones that can be received to the calling party in the process of making a call? State both the tone and the corresponding operation (Consider the cases of both successful and unsuccessful.)

(03 marks)
 - (d) Compare In-band signaling with Out-band signaling.

(03 marks)
 - (e) What are the advantages of using a.c. signaling methods on very long lines when compared with d.c. signaling methods?

(04 marks)
 - (c) What is stored program control (SPC)? Discuss the advantages of SPC automation in telephone switching.

(05 marks)
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3. (a) Explain the differences between *Traffic Offered* and *Traffic Carried* with regard to a telephone exchange.

(04 marks)
 - (b) What is the unit of traffic?

(01 mark)
 - (c) During the busy hour 1140 calls were offered to an exchange. The average call duration was 3 minutes. The Grade of Service of the exchange is 1%. Estimate.
 - (i) Offered Traffic to the exchange

(03 marks)

- (i) Carried Traffic by the exchange (03 marks)
- (ii) Lost traffic (03 marks)
- (iv) Number of trunks in the exchange using the Table Q3. (03 marks)
- (v) If the number of trunks of the exchange is increased by 3, what is the new Grade of Service? (03 marks)

Number of trunks	1 lost call in			
	50 (0.02)	100 (0.01)	200 (0.005)	1000 (0.001)
	E	E	E	E
68	57.2	54.2	51.9	47.5
79	58.2	55.1	52.8	48.3
70	59.1	56.0	53.7	49.2
71	61.0	57.0	54.6	50.1
72	62.0	58.0	55.5	50.9
73	62.9	58.9	56.4	51.8
74	62.9	59.8	57.3	52.6
75	63.9	60.7	58.2	53.5

Table Q3. : Traffic capacity table

4. (a) Define *Grade Of Service* and *Full availability* regarding a telephone exchange. (02 marks)
- (b) State the assumptions that are made when using Erlang's B formula. (02 marks)
- (c) A small telephone exchange in a city has a full availability group of 5 circuits.. During the busy hour, on average, 30 E is offered and the average holding time of a subscriber is 55sec. Find,
- (i) the number of busy hour call attempts (03 marks)
 - (ii) the probability that no circuits are occupied at a given time (03 marks)
 - (iii) the probability that at least 3 circuits are occupied at a given time. (3 marks)
 - (iv) the Grade of Service of the exchange. (03 marks)
 - (v) the Grade of Service for a 15% overload (04 marks)
5. (a) Briefly Explain the difference between
- (i) Cross Bar Switching and Electronic switching
 - (ii) DTMF signaling and Pulse signaling
 - (iii) The MDF and the IDF
 - (iv) Local Battery system and Common Battery system
 - (v) Time Congestion and Call congestion (20 marks)

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6. (a) What are the basic functions of a conventional telephone exchange? (05 marks)
(b) Explain the difference between a public exchange and a Private Branch Exchange. (02 marks)
(c) Briefly describe 5 important facilities available in a PABX. (10 marks)
(d) State different ways of expanding an existing PABX system to cater for more subscribers and more traffic. (03 marks)

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E
7.5
8.3
9.2
0.1
0.9
1.8
2.6
3.5

7. (a) What do you understand by following methods used in telephone billing?
(i) Flat rate
(ii) Unit fee
(iii) Unit fee timed (06 marks)

(b) Analysis of the local outgoing calls for the month of May 2005, taken by a subscriber A is as given below. Assume that he has taken only local outgoing calls during this month.

<u>Duration (minutes)</u>	<u>Number of calls</u>
2	25
3	12
4	7
5	5

Calculate A's call charges for May 2005,
(i) based on the flat rate method with a monthly rental of Rs. 300/- (02 marks)
(ii) based on the unit fee method where each call is charged at Rs. 3/- (06 marks)
(iii) based on the unit fee timed method where charge for one metering pulse is Rs. 2/- and duration allowed for a unit is 100secs within the same local area. (06 marks)

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8. (a) Explain the operation of a cross bar switch using a block diagram. (10 marks)
(b) Draw a block diagram of a typical exchange power plant and explain it briefly. (10 marks)

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