Dar es Salaam Institute of Technology

Department of electronics and telecommunication engineering

ETU7420: Communication Switching Systems

TEST 01

Time 1.5hrs

Section A (Attempt all questions A - E)

Question One (10marks)

A. Distinguish Inband from Out band Signaling System[2marks]

B. Draw the queuing model of delay systems. (2marks)

C. Define calling rate and holding time (2marks)

D. Explain briefly the use of Numbering plans. (2marks)

E. Explain briefly state transition diagram. [2marks]

Section B (Attempt all two question 10marks)

Question Two

A. List of four (4) common features of billing systems. **[2marks]**

B. A TANESCO Call Centre has 5 operators and receives 45 calls during a busy hour (BH). The average holding time is 4mins. Assume that call arrivals are poisonian and service time is negative exponential distribution. Calculate (i) the percentage of calls on queue (ii) average waiting time (iii) percentage of calls delayed for more than 3mins. **[8marks]**

Question Three

A. Give four major benefits to the network operator derived by implementing a network management system (NMS). **[4marks]**

B. Brief explain the following in relation to SS7 protocol architecture (i) Signaling Switching Points (SSP's) (ii) Signaling Transfer Point (STPS) (iii) Signaling Control Points (SCP's **[6marks]**

DAR ES SALAAM INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING

SEMESTER II EXAMINATION 2019/2020

BEng 18T

ETU 07420: SWITCHING SYSTEMS

TIME: 3 HOURS **DATE: AUGUST, 2020**

Instructions

1. Follow all instructions written on your answer booklet.
2. This paper consists of TWO Sections, A and B.
3. Attempt questions ONE in Section A and ANY FOUR questions in Section B.
4. You are not allowed to write anything on the question paper.
5. Write in Black/Blue ink and draw diagrams in pencil.
6. Write clearly.
7. Phones are not allowed in the examination room.

This paper consists of 4 printed pages

SECTION A [20 Marks]

Question One

A. Define the term multiplexing as applied to Switching System. [1marks]

B. Explain briefly cross talk as applied to switching system. [2marks]

C. Explain briefly state transition diagram as to applied to Communication switching systems. [2marks]

D. Distinguish In-band from Out-band Signaling System [2marks]

E. Draw the queuing model of delay systems. [3marks]

F. Define cost ratio as applied in Switching System. [2marks]

G. Mention two basic goals of the network management. [2marks]

H. Distinguish Real-Time Protocol (RTP) from Real-Time Control Protocol (RTCP) as applied to Communication switching Systems. [2marks]

I. Consider a Call center with 1500 new calls in an hour, and the average holding time is 3 minutes. Find the traffic intensity. [2marks]

J. Differentiate ISDN primary rate from ISDN basic rate as applied to Communication switching systems. [2marks]

SECTION B [40 Marks]

Question Two

A. Mention at least four features of SS7. [4marks]

B. With the aid of neat diagrams mention and explain three ways of implementing Common Channel Signalling. [6marks]

Question Three

A. Explain briefly the following as applied to communication systems. [4marks]

   i. International telephone numbering format.

   ii. Nation numbering format.

B. Explain briefly with examples the purpose of the following networks. [6marks]

Question Four

A. With an aid of sketch show how the switching systems can be classified? [2marks]

B. List four requirements of an effective switching system. [4marks]

C. Given that MTBF = 2200hrs and MTTR = 6 hrs. Calculate the five years unavailability for the following processors, [4marks]

   i. Single processor and

   ii. Dual processor.

Question Five

A. Define calling rate and holding time. [1marks]

B. Consider a link between DIT main Campus and Mwanza Campus with two packet routers. Assume that, on average, 50,000 new packets arrive in a second, the mean packet length is 1500 bytes, and the link speed is 1Gbps. Find the traffic load and the utilization. [3marks]

C. Consider telephone traffic carried by a 5-channel link in the telephone network. Use a pure loss system model. New calls arrive according to a Poisson process at rate 2 calls per minute, and call holding times are independently and identically distributed with mean 3 minutes. Calculate [6marks]

   (i) The traffic offered,

   (ii) The traffic carried, and

   (iii) The traffic lost.

Question Six describe the term product

A. Explain briefly the following terms as applied to telecommunication Switching Billing System? Give two examples of products. [2marks]

B. Distinguish Pre-pay Billing from Post-pay Billing as applied to Communication switching systems. [2marks]

C. list of four [4] common features of Billing systems. [2marks]

D. Consider a part of TTCL Data network, which is connected to the rest of the network through four of its nodes. The average number of packets 1000. Let the arrival rates [packets per second] of the packets from other parts of the network to these four

Routers is $\lambda_1 = 200$, $\lambda_2 = 300$, $\lambda_3 = 400$, and $\lambda_4 = 500$. How long does a packet stay in the subnetwork on average? [4marks]

Question Seven

A. Explain briefly NEXT and FEXT as applied to communication switching systems network local loop. [4marks]

B. An exchange uses – 48 V battery, a resistance of 150ohm is placed in series with the battery. If the telephone set resistance is 50ohm, calculate the loop resistance limit for the minimum current requirement of 40mA for carbon microphone. [6marks]

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING

SEMESTER I EXAMINATION 2018/2019

BEng 17T

ETU 07420: SWITCHING SYSTEMS

TIME: 3 HOURS **DATE: JUNE, 2019**

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SECTION A (20 Marks)

Question one

A. Define Traffic Intensity. (1mark)

B. With the aid of sketch briefly explain ITU recommendation for International numbering plan. (3marks)

C. Briefly explain the primary functions of transmission systems. (2marks)

D. Define a) local loop and b) trunks. (2marks)

E. List four Limitations of manual exchanges. (2marks)

F. Give the expression of System availability. (2marks)

G. Define calling rate and holding time. (2marks)

H. A call established at 1a.m. between a mobile and MSC. Determine the traffic intensity if the call is terminated at 1.40 a.m. (2marks)

I. Briefly explain the basic goal of the network management. (2marks)

J. Explain briefly the use of Numbering plans. (2marks)

SECTION B (40 Marks)

Question Two

A. How the switching systems can be classified? (1marks)

B. Explain the functions of a switching system with signal exchange diagram. (7marks)

C. List at list four requirements of an effective switching system. (2marks)

Question Three

A. Mention four limitations of manual exchanges. (2marks)

B. Mention one advantage and three disadvantages of Strowger switching system.(4marks)

C. Write short notes on (a) uniselector and (b) two motion selector. (4marks)

Question Four

A. Briefly explain the basic concepts of Circuit and Packet switching Techniques. (4marks)

B. A group of 6 trunks is offered 4E of traffic, find (i) the grade of service (ii) the probability that only one trunk is busy (iii) the probability that only one trunk is free (iv) the probability that at least one trunk is free. Hint using Erlang B formula (6marks)

Question Five

A. Mention different forms of signaling (3marks)

B. Draw neat diagram of protocol architecture of SS7 showing all the layer. (4marks)

C. Briefly explain the following in relation to SS7 protocol architecture (i) Signaling Switching Points (SSP's) (ii) Signaling Transfer Point (STPS) (iii) Signaling Control Points (SCP's (3marks)

Question Six

A. Define the following (a) Erlang (b) Centum Call Seconds (CCS) (2marks)

B. Define GOS and Traffic Intensity: (2marks)

C. During a busy hour, 1500 calls were offered to a group of trunks and 20 calls were lost. The average call duration has 3 minutes. Find (i) Traffic offered (ii) Traffic carried (iii) GOS and (iv) The total duration of period of congestion. (6marks)

Question Seven

A. Define traffic congestion and briefly explain the two types of congestion. (4marks)

B. Consider TTCL Fixed PSTN with a trunk group of 10 circuits serving a first attempt offered traffic load of 7erlangs. (i) What is the blocking probability? (ii) If the number of circuits increased to 14, what is the blocking probability? (Hint use Erlang Chart) (6marks).

The Erlang B chart showing the probability of blocking as functions of the number of channels and traffic intensity in Erlangs