Dar es Salaam Institute of Technology

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Communication Switching Systems

Course Code: ETU7420

TEST 02 - Marking

Time one (1) Hour

Section A (Attempt all questions A - E)

Question One (10marks)

A. Distinguish Inband from Out band Signaling. *(2marks)*

Answer

Inband Signaling: *control signal frequencies are within the speech band (300– 3400 Hz),*

Out band: *signaling has frequencies above the voice band but below the upper limit of 4 kHz.*

B. Draw the symbols of STP, SSP and SCP. *(2marks)*

Answer

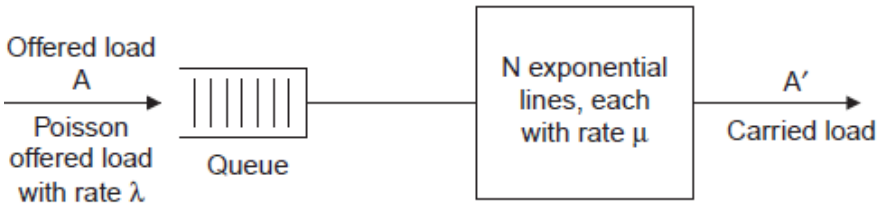
STP Symbol

SSP Symbol

SCP Symbol

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

Answer



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

Answer

a) *Calling rate is the average number of requests for connection that are made per unit time.*

b) *Holding time is the length of time that a resource is being held (e.g. duration of a phone call)*

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

Answer

Numbering plans: *used to identify the subscribers connected in a telecommunication network. The main objective is to standardize the number length wherever practical according to ITU and national regulatory (TCRA) recommendations*

Section B (Attempt/select only one (1) question 5marks)

Question Two

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 4 minutes. Find (i) The traffic offered, (ii) (iii) the traffic carried, and (iv) The traffic lost. *(5marks)*

Answer/Solution

a) Traffic intensity (Offered traffic)

*A = nh/T = λ *h = 2 calls per minute43 minutes. = 8E*

b) The traffic carried,

A_C = A (1 – P_B (N, A)) Erlangs

Blocking probability P_B (N, A) can be calculated use the B formula as follows

From formula

$$P_B(N,A) = \frac{\frac{A^N}{N!}}{\sum_{k=0}^{N}\frac{A^k}{k!}}$$

$$P_B(5,8) = \frac{\frac{8^5}{5!}}{\sum_{k=0}^{5}\frac{8^k}{k!}}$$

$$P(5,8) = \frac{8^5}{5! * \left[1 + \frac{8}{1} + \frac{8^2}{2!} + \frac{8^3}{3!} + \frac{8^4}{4!} + \frac{8^5}{5!}\right]}$$

$$P(5,8) = \frac{32768}{120 * \left[1 + \frac{8}{1} + \frac{64}{2} + \frac{512}{6} + \frac{4096}{24} + \frac{32768}{120}\right]}$$

$$\frac{32768}{120 * 570.0666667}$$

0.479

*A_C= 8E *(1-0.3479) = 4.1679Erlangs*

c) *The traffic lost*

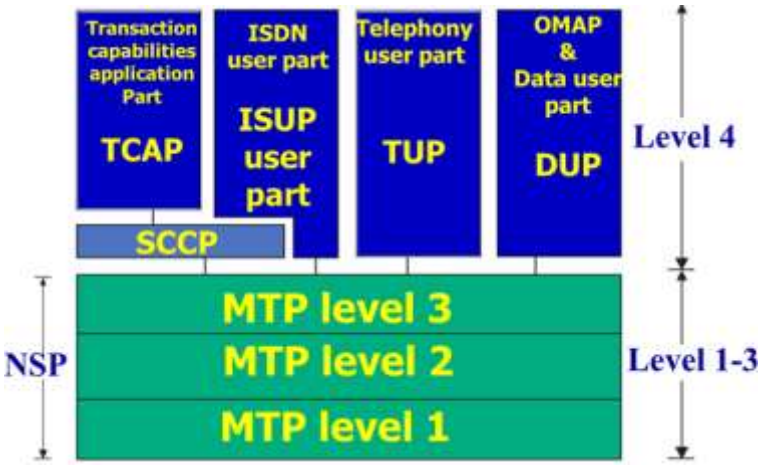
*A*P(5,8) = 8*0.479=3.832066425Erlangs*

Question Three

A. Draw neat diagram of protocol architecture of SS7 showing all the layer. (2*marks)*

Answer

The protocol architecture of SS7 is shown in figure below



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 (*3marks)*

Signal Transfer Points (STPs) *receive and routes incoming singling messages towards the proper destination. Also they perform specialized routing functions.*

STP Symbol

Signal Switching Points (SSP): *Telephone switches (end offices or tandems) equipped with SS7 - capable software and terminating signaling links. SSP originate, terminate, or switch calls.*

SSP Symbol

Signal Control Points (SCPs) are databases that provide information necessary for advanced call processing capabilities.

SCP Symbol