Department of Electrical Engineering

EEL716 **Telecommunication Switching and transmission**

Major Examination **May 7, 2007**
Closed Book/Notes

Time: 2 Hours
Max marks: 80

Note: attempt as much as you can.

Q 1.

(a) Draw the Markov chain diagram for a lost call cleared (LCC) system.

(b) In a TST switch, subscriber 5 in TSI 3 is to be connected to subscriber 17 in TSI 8 and vice-versa. Show a possible connection sequence.

(c) The binary sequence 1 1 1 0 1 0 0 0 0 0 0 0 1 1 1 1 is to be coded using B6ZS. What is the resulting sequence?

(d) What is ping-ponging in context of handoffs in cellular mobile communication? How can this be reduced?

(e) Write an expression for G/T ratio for an earth station for a satellite communication down-link. **[3x5=15]**

Q 2. In a mobile telephone network, calls are generated at an average rate of 4 calls/minute (Poisson rate) with average holding time 20 sec (exponential service). Calls which cannot be dealt are assumed to be queued. Normally the system uses two dispatchers (servers). When the total number of calls in the system (queued plus under service) become 4 or more another (third) dispatcher is used. Calculate the percentage of time the third dispatcher is dealing with calls? **[15]**

Q 3. Obtain an expression for call service rate in a cell when total call duration is T and the mobility is ζ. **[5]**

Q 4. Consider the T_1-S_1-S_2-S_3-T_2 switch where input T stage consist of N TSIs, each TSI with x input and y output slots. Similarly number of output TSIs is N with each TSI having y input slots and x output slots. The internal S-S-S consists of standard three stage space switch with S_1: N/n number of n x k arrays; S_2: k number of (N/n)x(N/n) arrays ; S_3: N/n number of k x n arrays. Obtain an expression for probability of blocking in terms of $q_1 = (1 - a/\alpha)$, $q_2 = (1 - a/\alpha\beta)$ where a is the probability that a channel is busy , (α=x/y) and (β=k/n) **[10]**

Q 5. In a Ku band satellite link the required overall CNR, $(CNR)_{ud}$ is 17 dB and the specified uplink CNR, $(CNR)_u$ is 30dB. The satellite transmit power in the down link is 1 dB below 80 W. Other downlink specifications are given below.

Downlink frequency	:	11.45 GHz
Operating bandwidth	:	43.2. MHz
Free space loss	:	-205.4 dB
Satellite antenna gain	:	31.0 dB
Pointing and edge contour loss:		-3.8 dB
Sky noise received by the earth station antenna (antenna noise temperature)	:	30^0K
Earth station receiver noise temperature (at its input)	:	110^0K
Receive antenna efficiency	:	65%

Calculate the diameter of the receive antenna, which is a parabolic dish with circular aperture.

If needed use Boltzmann's constant k= 1.38 x 10^{-23} J/°K. **[15]**

Q 6. How can all the topics of term papers be combined in a meaningful manner to present an integrated picture of modern telecommunication systems? **[5]**

Q 7. Answer / comment/ justify/ refute (as applicable) in context of the following, and excluding the question related to your term paper.

[2.5x6=15]

(a) "Troposcatter and ionoscatter are similar phenomena", Comment?
(b) "SONET /SDH multiplexing hierarchy is more complicated compared with PDH hierarchy" Justify or refute?
(c) "Mobile satellite communication systems are always beneficial than the geostationary earth orbit satellite communication systems", Comment.
(d) How can a multitop photonic network be configured?
(e) Illustrate various topologies used in PON s.
(f) How is ISDN different from multiplexed channels.
(g) Give mapping of SS#7 protocol stack w.r.t OSI protocol stack.