TUT-1 (Solution)

Q-1 – Self study.

Q-2 – Sucessful calls = BHCA X CCR

Busy hr. calling rate = $\frac{\text{sucessful calls}}{\text{No. of subscribers.}}$

$= \frac{20{,}000 \times 0.60}{5000}$

Q-3. traffic /server = $\frac{10}{30}$ E

servery busy duration = traffic x observation time

$= \frac{10}{30} \times 60$ MINS

Sucessful call/server = $\frac{\text{Busy duration}}{\text{call duration}} = \frac{10/30 \times 60}{4}$ MIN

Sucessful call by group of server

= No. of servers X call/server

$= 30 \times \frac{10/30 \times 60}{4}$

Q-4 traffic in Erlang = $\frac{\text{Busy duration}}{\text{observation duration}}$

$= \frac{2400 \text{ calls} \times 2 \text{ MIN/call}}{2 \times 60 \text{ MIN}}$

$= 40E$

in CCS $\Rightarrow$ 1 E = 36 CCS

40 E = 1440 CCS

in CS $\Rightarrow$ 1440 x 100 CS

in CM = $\frac{1440 \times 100}{60}$ CM

Q (5)

$$BHCR = \frac{BHCA \times CCR}{N \text{ (subscriber)}}$$

(2)

$$BHCA = \frac{BHCR \times N}{CCR} = \frac{4.8 \times 10,000}{0.8}$$

$$= 60,000$$

(t_p) call processing time $= \frac{1 \text{ hr}}{BHCA} = \frac{60 \text{ MIN}}{60,000} = \underline{60 \text{ ms}}$

Q.6

$t_p = 120 \text{ ms}$

$$BHCA = \frac{1 \text{ hr}}{t_p} = 30,000$$

Carried (sucessfull) traffic = 700 E

Offered traffic (in E) $= \frac{BHCA \times \text{call duration}}{\text{observation time}}$

$$= \frac{30,000 \times 2 \text{ MIN}}{60 \text{ MIN}} = 1000 \text{ E}$$

$$CCR = \frac{\text{Successfull traffic}}{\text{offered "}} = \frac{700}{1000} = \underline{0.7}$$

Q.7:

$$GOS = \frac{\text{Lost traffic}}{\text{offered traffic.}}$$

offered traffic $(A) = \frac{(\text{total calls}) \times \text{call duration}}{\text{observation time}}$

$$A = \frac{(180+180) \times 200 \text{ sec}}{60 \times 60 \text{ sec}} = 20 \text{ E}$$

Let carried traffic = A0 E

[each line/server can carry max 1E)

$$GOS = 0.05 = \frac{A - A_O}{A}$$

$$0.05 = \frac{20 - A_O}{20}$$

$$A_O = -20 \times 0.05 + 20 = 20 - 1 = 19E$$

To carry 19E we need (19) Lines.

0.8

Offered traffic (A) = 1100 calls/hr × 3 MIN/calls

= Call Arrival rate × call duration

= 1100 call/60 MIN × 3 MIN/call

A = 55E

Line available 50, so carried traffic $A_O = 50E$

$$GOS = \frac{A - A_O}{A} = \frac{55 - 50}{55} = \frac{5}{55} = \frac{1}{11} \simeq 0.091$$

0.9

Max Calls carried = 2000

Offered calls = 2900

Lost calls = 900

$$GOS = \frac{\text{Lost calls}}{\text{offered ..}} = \frac{900}{2900} = \frac{1}{11} \simeq 0.091$$

0

(C) Call arrived rate = 40/20 = 2 call/MIN

(tn) call time = $t_n = \frac{4800}{40 \times 60} = 2$ MIN/call

offered traffic = $C t_n = 2 \times 2 = 4E$

Avg. Subscriber traffic = 4/40 = 0.1E