Name: ..... Student ID: .....

PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Mid-Term Examination: Semester II Academic Year: 2010

Date: December 24, 2010 Time: 09.00 – 11.00 (2 hrs)

Subject: 241-553 High Speed and Broadband Integrated Networks Room: หัวหุ่น

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

Instructions

(a) In this paper exam, there are FIVE questions, 11 pages.

(b) Try to answer ALL questions.

(c) Answers could be either in Thai or English.

(d) Calculators, books, and notes are NOT allowed.

1. Answer the following questions (15 marks):

1.1 Please describe the mechanism given in Figure 1 what it is used for, and how it works (HUNT Mode, PRESYNC Mode และ SYNCH Mode) (4 marks)

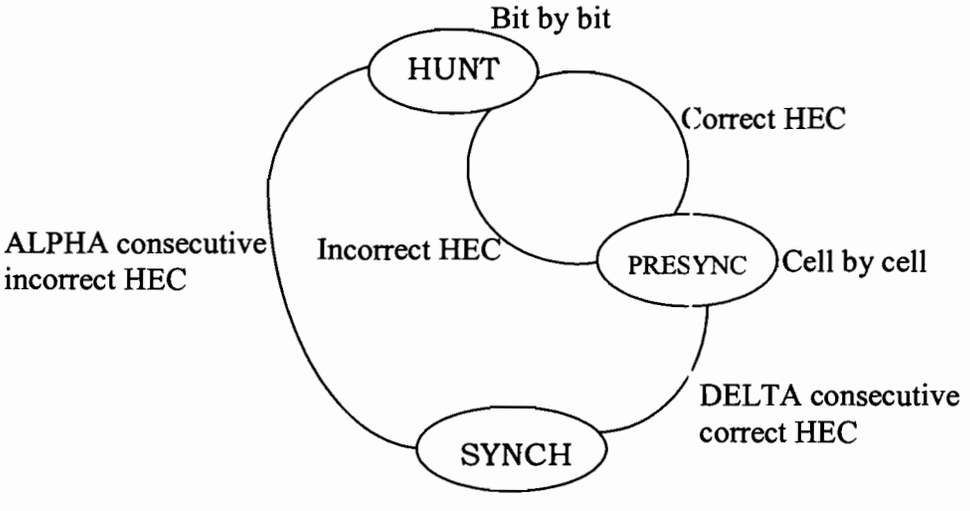


Figure 1 for question 1.1

Name: ..... Student ID: .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1.2 What are the differences between (6 marks)

(a) open loop and closed loop flow controls (please show the figures of both mechanisms)

(b) preventive and reactive flow controls (please show the graph of working region of both mechanisms)

.....

.....

.....

.....

.....

.....

.....

.....

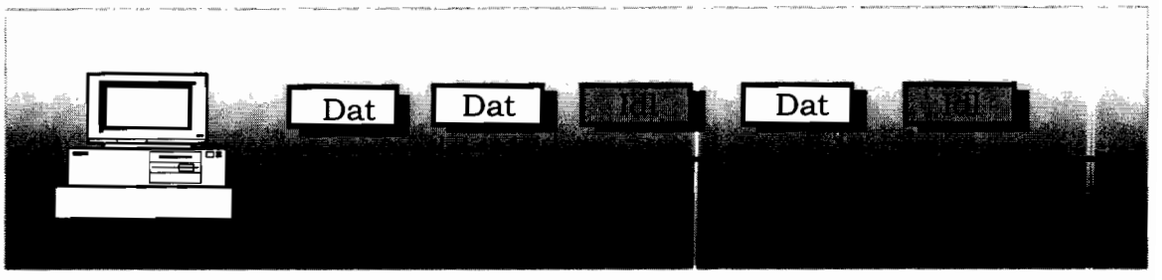
.....

.....

.....

1.4. What is Cell Rate Decoupling used for (3 marks)

Name: ..... Student ID: .....



.....

.....

.....

.....

.....

.....

1.5.Please describe about CDV (Cell Delay Variation) (2 marks)

.....

.....

.....

.....

.....

.....

2. Variable Bit Rate (VBR) (10 marks)

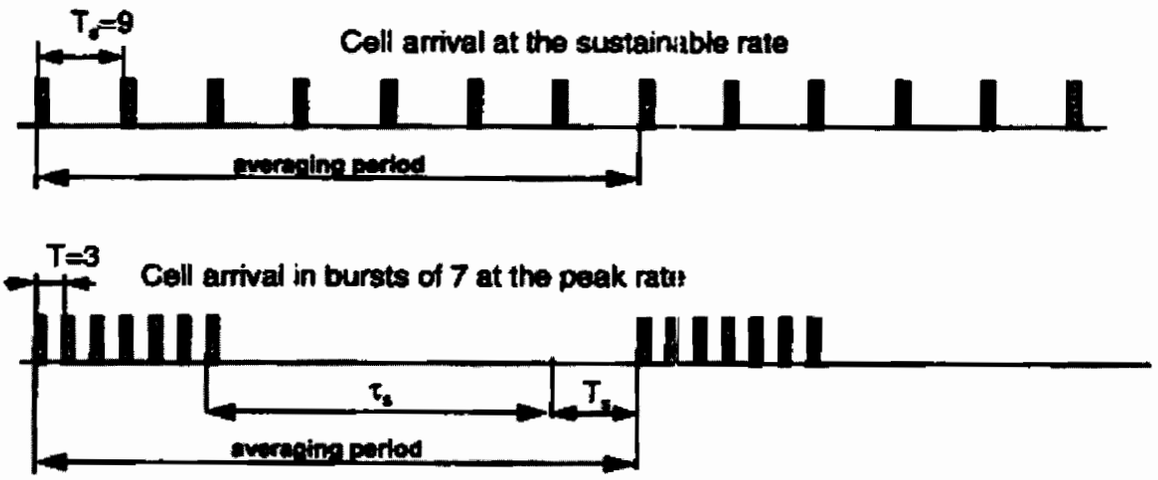
The figure below shows how to derive VBR parameters where:

Ts is the average cell arrival rate (Ts = 9)

T is the peak cell rate (T = 3)

τs is the burst tolerant

Name: ..... Student ID: .....



After a burst, the silent period must be long enough to restore the value of the average sustainable rate. This means, if S is the size of the burst at peak rate, that we must have

$$T_s \cdot S \leq T \cdot (S-1) + (\tau_s + T_s)$$

Please find the Maximum Burst Size (MBS) that can be transmitted at the peak rate and still be in conformance with the GCRA (Ts, τs), according the given parameters above.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3. We consider an analytical model for explicit rate flow control as shown in Figure 2. This scenario is used for the equal *ICR* case. There are 2 source groups: *S1* and *S2*. Group *S1* comprises 1 sources (*S1*=1) and group *S2* comprises 1 sources (*S2*=1). The round trip time

Name: ..... Student ID: .....

between *S1* and its destination, and *S2* and its destination are 0.015 sec and 0.0005 sec respectively. All sources start transmitting data at 3 Mbps (*ICR*=3 Mbps) at time 0. The switch allocation bandwidth is 147 (155x95%) Mbps and the service rate is 155 Mbps (*BW*=155 Mbps). The switch queue is not fully utilised since the total offered load is less than the service rate. The following parameters are used in this scenario: *PCR*=155 Mbps, *RIF*=1/256. All sources are saturated sources, e.g. always send data as high as requested by the network. [Hint: The *S2* rate converts to *ER* before *S1* due to a shorter round trip time delay]. All necessary formulas are shown below.

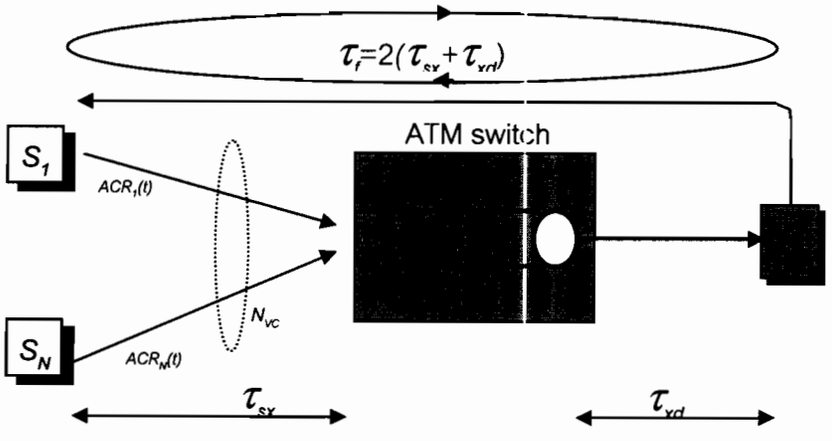


Figure 2 Analytical model for explicit rate flow control

Name: ..... Student ID: .....

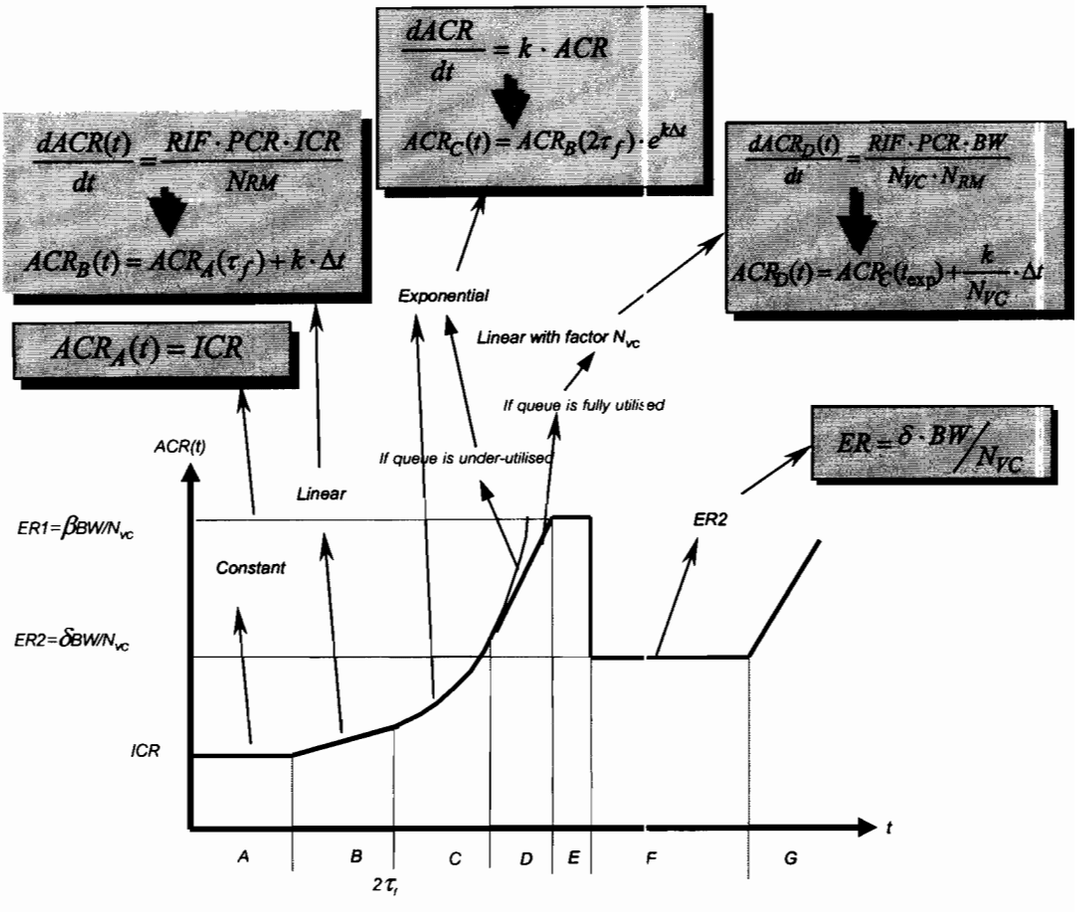
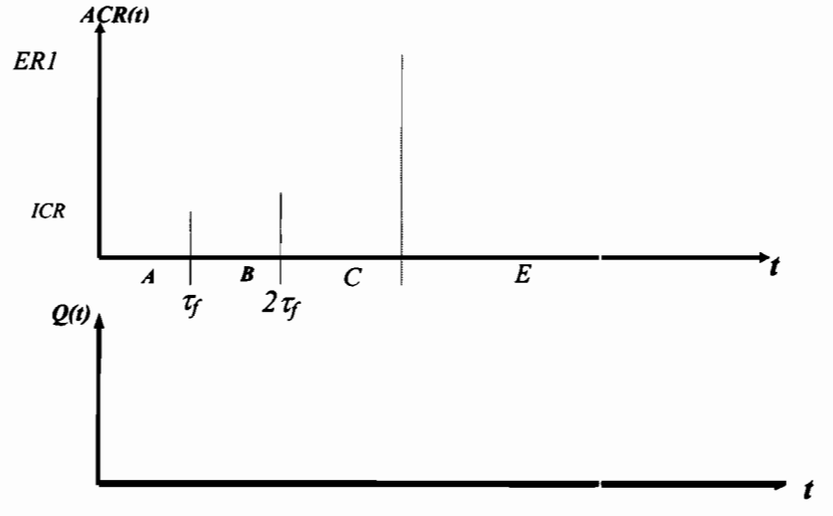


Figure 3 Source rate behaviour as a function of time with equal *ICR*

3.1 Draw a graph of transmission rate of the source S2 (5 marks)



Name: ..... Student ID: .....

3.2 What are the values of ER1 and ER2? (5 marks)

3.3 What is the condition that phase D will not be happen? (5 marks)

Name: ..... Student ID: .....

.....

.....

.....

.....

.....

3.4 What are the time periods of phase A and B? (5 marks)

.....

.....

.....

.....

.....

.....

4. Figure 4 shows time slot of CBR traffic. Please state that which ATM cells are conform and non-conform using GCRA (Generic Cell Rate Algorithm) with the following parameters (10 marks):

T(PCR) = 4 cell time, τ(PCR) = 2 cell time (15 points)

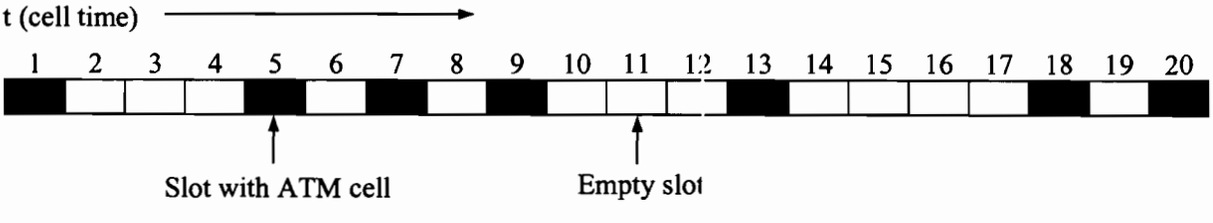


Figure 4 Time slots of CBR

Name: ..... Student ID: .....

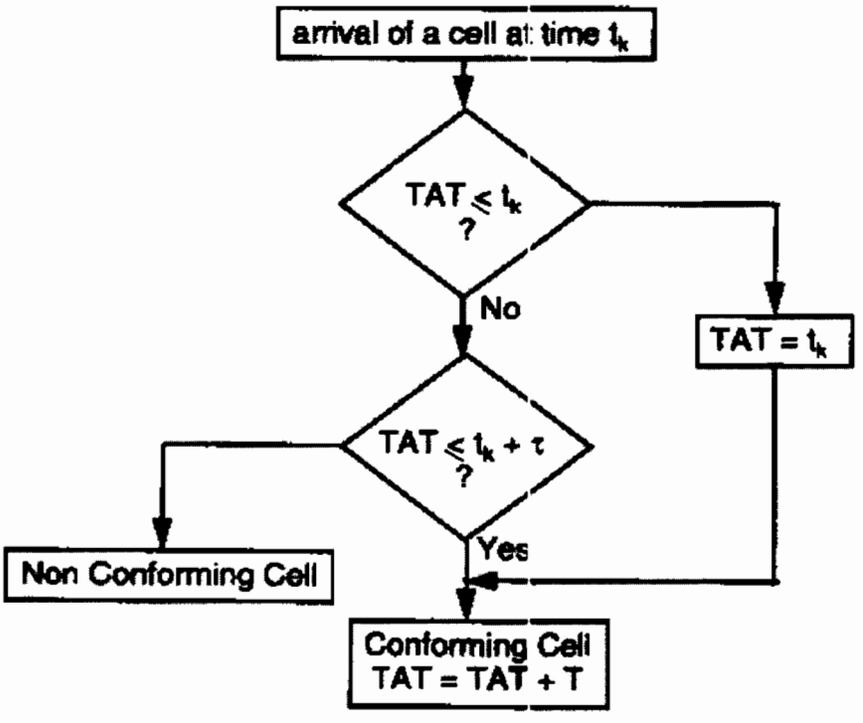


Figure 5 Generic Cell Rate Algorithm

Answer

t = 1: TAT = 1, conforming, TAT = 1 +4 = 5

t = 5: _____

t = 7: _____

t = 9: _____

t = 13: _____

t = 18: _____

t = 20: _____

5. The following steps are the rule for worst case allocation for VBR VCs (20 Marks):
    1. Assume that all connections are compliant with GCRA(1/PCR,0) and GCRA(1/SCR,τ_s),
    2. Determine N, the maximum number of source NxSCR ≤ PCR,

Name: ..... Student ID: .....

3. Find out the worst case for one source with MBS = integer $[1+\tau_s/(1/SCR - 1/PCR))]$,
4. Assume that all sources are synchronised and transmit their worst case traffic,
5. Find the buffer size to avoid any overflow $Req\_Buf = (N\text{-}PCR_o/PCR) \times MBS$,
6. Compute the maximum delay $D \leq Req\_Buf/PCR_o$.

In our system the out-going link bandwidth is 155 Mbps. There are four types of sources tested in our system with the following source traffic parameters:

Type A: MSB = 200 cells, SCR = 5,000 cells/sec, PCR = 25 MBPS

Type B: MSB = 200 cells, SCR = 5,000 cells/sec, PCR = 155 MBPS

Type C: MBS = 1,000 cells, SCR = 15,000 cells/sec, PCR = 59,000 cells/sec

Type D: MBS = 1,000 cells. SCR = 15,000 cells/sec, PCR = 367,000 cells/sec

The following contact parameters are given

For peak rate: GCRA(1,0) and

For average rate: GCRA (3,8)

Please determine (you must show how you get the answer).

a) Maximum number of connections (10 marks)
b) Minimum buffer size (10 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....