

มหาวิทยาลัยสงขลานครินทร์  
คณะวิศวกรรมศาสตร์



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สอบกลางภาค: ภาคการศึกษาที่ 1	ปีการศึกษา: 2554
วันที่สอบ: 5 สิงหาคม 2554	เวลาสอบ: 13.30-15.30
รหัสวิชา: 241-462	ห้องสอบ: A400
ชื่อวิชา: Broadband Integrated Networks	อาจารย์ผู้สอน: รศ.ดร.สินชัย กมลภิวงศ์

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อ่านรายละเอียดของข้อสอบ และคำสั่งให้เข้าใจก่อนเริ่มทำข้อสอบ

ไม่อนุญาต : - หนังสือและสมุดโน้ต  
- เครื่องคิดเลข

อนุญาต : - เครื่องเขียนต่างๆ เช่น ปากกา หรือดินสอ

เวลา : 2 ชั่วโมง (120 นาที)

รายละเอียดของข้อสอบ : ข้อสอบมีทั้งหมด 13 หน้า (ไม่รวมปก)

คำสั่ง :

- ข้อสอบมีทั้งหมด 9 ข้อ ( 116 คะแนน) ให้ทำทุกข้อ
- คำตอบทั้งหมดจะต้องเขียนลงในสมุดคำตอบ
- คำตอบส่วนใดอ่านไม่ออก จะถือว่าคำตอบนั้นผิด

-- ทูจริติในการสอบมีโทษขั้นต่ำปรับตกในรายวิชานี้ และพักการเรียน 1 ภาคการศึกษา --

-- โทษสูงสุดคือ ไล่ออก --

1. Answer the following questions (16 marks)

1.1 What are the main differences between “Space Switching” and “time Switching”? (4 marks)

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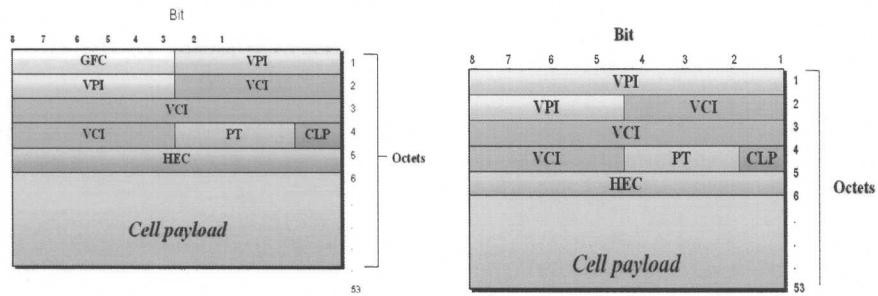
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1.2 According to the below ATM Cell structures, show the maximum virtual channel per port at UNI (User-Network Interface) and NNI (Network-Network Interface) (4 คะแนน)



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1.3 What are the differences between open loop and closed loop flow control? (4 points)

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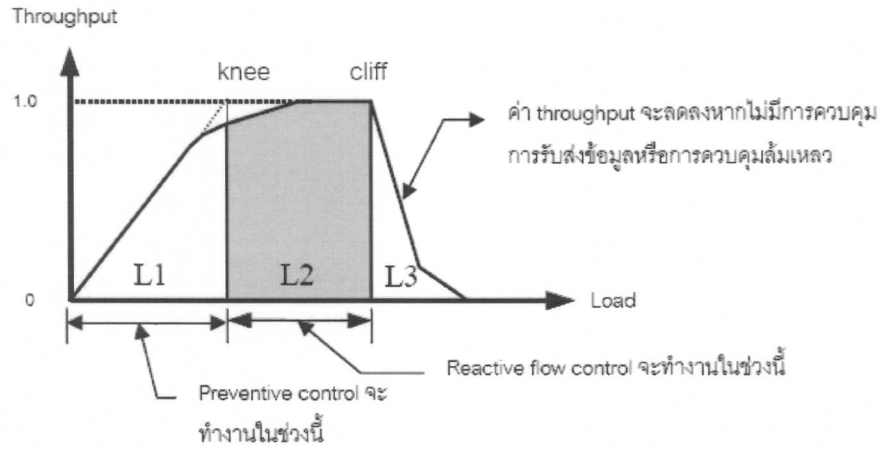
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1.4 What are the differences between preventive flow control and reactive flow control? (4

points)



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2. From the given Figure1 below, please explain how each step works (HUNT Mode, PRESYNC Mode and SYNCH Mode) (10 marks)

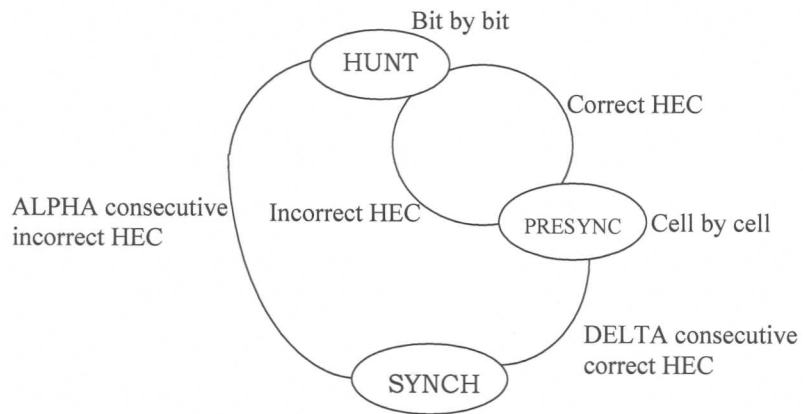


Figure1 for question no. 2



Port In	VCI In	VCI Out	Port Out	internal header
1	6	10	1	0,1,1
1	8	15	2	1,1,1
3	6	18	3	1,0,1
3	8	20	4	0,1,0
5	6	22	5	0,0,1
5	8	18	6	1,0,0

**Table 1** Cell routing table in ATM Switch

3.1 What are the output ports of cell A, B and C? (5 marks)

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 .....  
 .....

3.2 What are VCI values of cell A and B at the output? (5 marks)

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 .....  
 .....

3.3 If we want cell A routed to output port number 7, what the internal header values for cell A are. (5 marks)

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 .....  
 .....

4. Below is the 8 x 8 Knockout Switching Element structure (Input 8 ports, Output 8 ports) with 8 x 4-type concentrators (Input 8 ports, Output 4 ports). Answer the following questions.

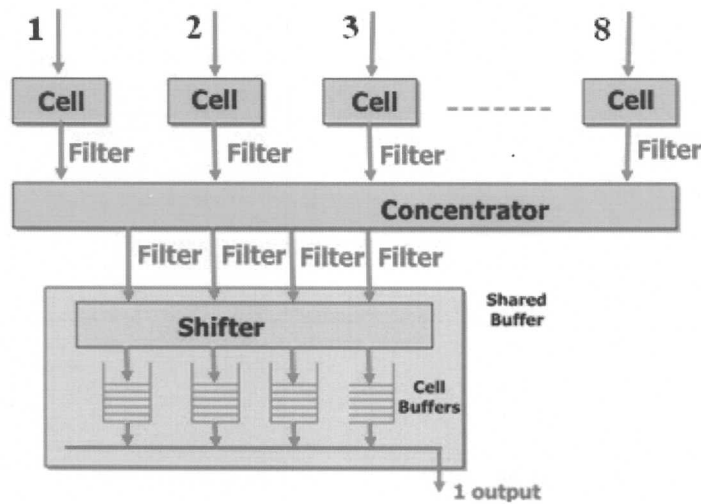
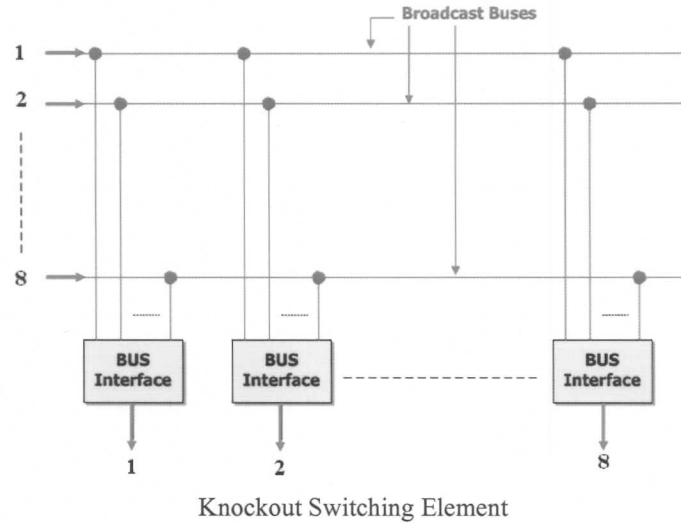


Figure 3 Use the above diagram in answering question no. 4.

- 4.1 How many rows of cell buffers are required in this Knockout Switching Element structure? (5 marks)

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.....

.....

4.2 If there are 8 cells of data and each cell of the 8 cells enters each input port simultaneously with all the 8 cells exiting at one same output port number 1, how many cells are dropped? (5 marks)

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.....  
.....

5. There are 4 nodes in the communication system as shown in Figure 4 (A). Node A and B transmit data by using router R to deliver traffic to their destination nodes C and D respectively. Only a single buffer is provided in R (traffic from A and B are stored into the same buffer). The service discipline of R is first-come-first-serve. The link bandwidth, which is a normalised value and indicated by C, are 8, 2, 2, 3 for the link A-R, B-R, R-C, and R-D, respectively. Node B is a fixed transmission rate source while A is a variable rate source. Node A is able to vary its transmission rate,  $f$ , up to 8. Node B transmits data first until time zero then node A inserts its traffic. From the given graph in Figure 4 (B), answer the following questions (please explain clearly):

5.1 Explain what, why, and how (a),(b),(c) and (d) happen, (10 marks)

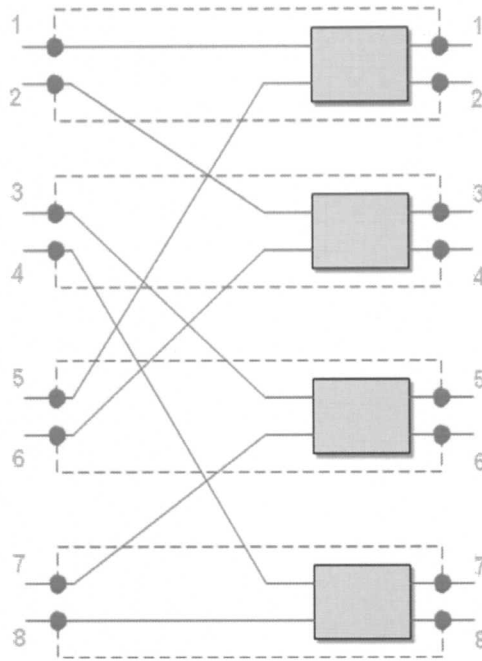
5.2 Give the normalised values in (e) and (f). Please show how you get such figures, (10 marks)











8. Figure 6 shows VBR traffic time slots (in cell time). Please show that which VCR cells are conform and non-conform using Generic Cell Rate Algorithm (GCRA) parameters as follows: (15 marks)

$T(\text{PCR}) = 1$  cell time,  $\tau(\text{PCR}) = 0$  cell time

$T(\text{SCR}) = 4$  cell time,  $\tau(\text{SCR}) = 3$  cell time

MBS = 3 cells

(15 marks)

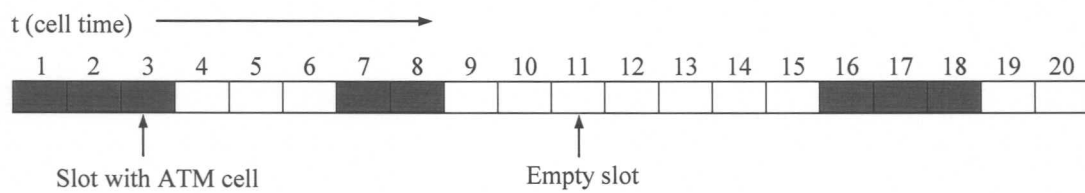


Figure 6 VCR traffic arrival time

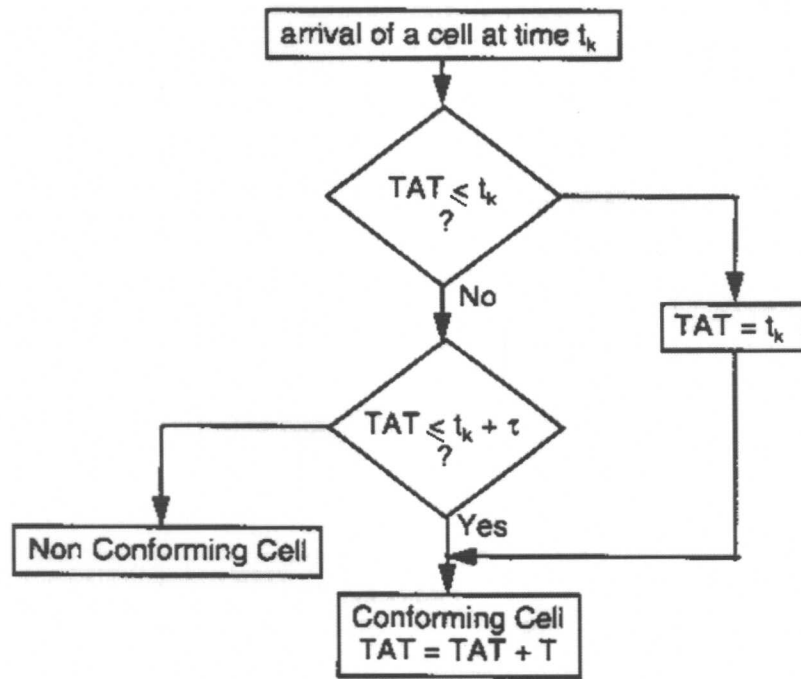


Figure 7 Generic Cell Rate Algorithm

Your answer (for PCR):

t = 1: TAT = \_\_, conforming, TAT = \_\_\_\_\_

t = 2: \_\_\_\_\_

t = 3: \_\_\_\_\_

t = 7: \_\_\_\_\_

t = 8: \_\_\_\_\_

t = 16: \_\_\_\_\_

t = 17: \_\_\_\_\_

t = 18: \_\_\_\_\_

**Your answer (for SCR):**

- t = 1: TAT = \_\_, conforming, TAT = \_\_\_\_\_
- t = 2: \_\_\_\_\_
- t = 3: \_\_\_\_\_
- t = 7: \_\_\_\_\_
- t = 8: \_\_\_\_\_
- t = 16: \_\_\_\_\_
- t = 17: \_\_\_\_\_
- t = 18: \_\_\_\_\_

9. Leaky bucket

Figure 8 shows *leaky bucket with data buffer* or *buffered leaky bucket with data buffer scheme*. Tokens are generated with rate  $\beta$  and stored in the token bucket which has finite capacity  $M$ . If the token bucket is full ( $\beta T \geq M$ ) then next token is discarded. An arrival cell from the data buffer is placed and transmitted with  $\mu$  rate with a token from the token bucket if the token bucket is not empty otherwise the cell is stored in the data buffer which has a finite capacity  $M$  if it is not full ( $N < M$ ) and discarded when it is full ( $N \geq M$ ). (10 marks)

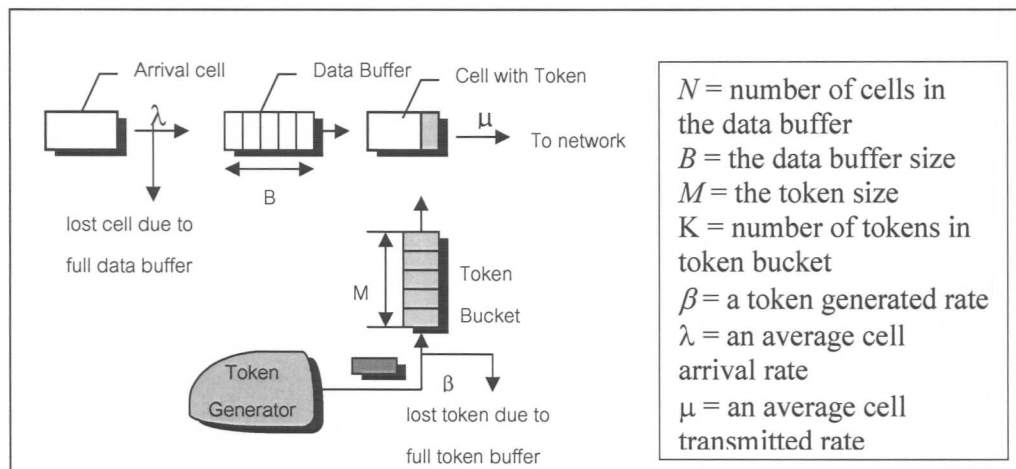


Figure 8 Leaky Bucket with data buffer

