# มหาวิทยาลัยสงขลานครินทร์ คณะวิศวกรรมศาสตร์

**สอบกลางภาก**: ภาคการศึกษาที่ 1

ปีการศึกษา: 2554

วันที่สอบ: 5 สิงหาคม 2554

เวลาสอบ: 13.30-15.30

รหัสวิชา: 241-462

ห้องสอบ: A400

ชื่อวิชา: Broadband Integrated Networks

อาจารย์ผู้สอน: รศ.คร.สินชัย กมลภิวงศ์

# อ่านรายละเอียดของข้อสอบ และคำสั่งให้เข้าใจก่อนเริ่มทำข้อสอบ

ไม่อนุญาต:

- หนังสือและสมุดโน้ต

- เครื่องคิดเลข

อนุญาต :

- เครื่องเขียนต่างๆ เช่น ปากกา หรือคินสอ

เวลา: 2 ชั่วโมง (120 นาที)

รายละเอียดของข้อสอบ : ข้อสอบมีทั้งหมด 13 หน้า (ไม่รวมปก)

คำสั่ง :

- ข้อสอบมีทั้งหมด 9 ข้อ ( 116 คะแนน)ให้ทำทุกข้อ
- กำตอบทั้งหมดจะต้องเขียนลงในสมุดกำตอบ
- คำตอบส่วนใคอ่านไม่ออก จะถือว่าคำตอบนั้นผิด

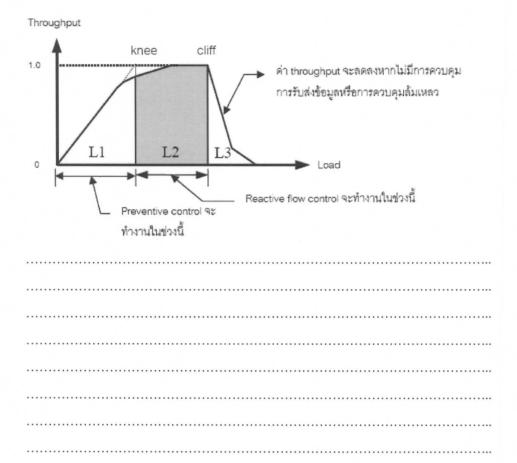
-- ทุจริตในการสอบมีโทษขั้นต่ำปรับตกในรายวิชานี้ และพักการเรียน 1 ภาคการศึกษา ---- โทษสูงสุดคือ ไล่ออก --

Stı	ident	Name Student ID
1.	Ans	wer the following questions (16 marks)
	1.1	What are the main differences between "Space Switching" and "time Switching"? (4
		marks)
	1.2	According the below ATM Cell structures, show the maximum virtual channel per port
		at UNI (User-Network Interface) and NNI (Network-Network Interface) (4 คะแนน)
		Total   Cell payload   State   Cell payload   State   State
	1.3	What are the differences between open loop and closed loop flow control? (4 points)

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

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





2. From the given Figure 1 below, please explain how each step works (HUNT Mode, PRESYNC Mode and SYNCH Mode) (10 marks)

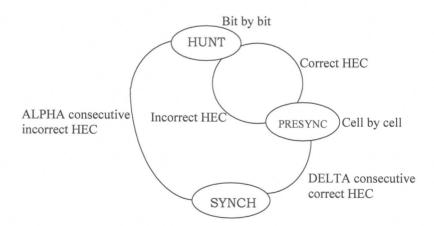


Figure 1 for question no. 2

Student	Name	Student ID

## 3. 3-stage delta network (15 marks)

Cell A and cell B enter to ATM switch as shown in the below picture. ATM switch architecture is a 3 Stages of Delta Network. Cell routing table is assigned below

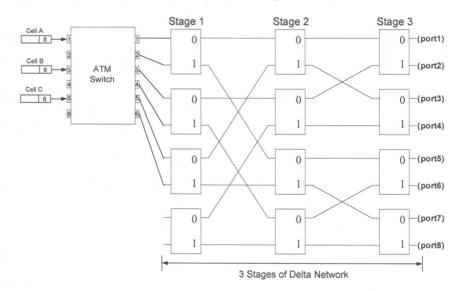


Figure 2 for question no. 3

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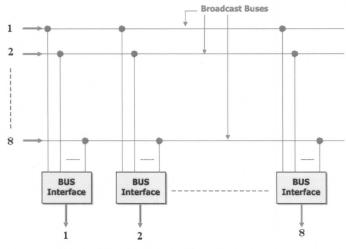
Port	VCI	VCI	Port	internal
In	In	Out	Out	header
1	6	10	1	0,1,1
1	8	15	2	1,1,1
3	6	18	3	1,0,1
3	8	20	4	0,1,0
5	6	22	5	0,0,1
5	8	18	6	1,0,0

Table 1 Cell routing table in ATM Switch

	What are the output ports of cell A, B and C? (5 marks)
3.2	What are VCI values of cell A and B at the output? (5 marks)
3.3	If we want cell A routed to output port number 7, what the internal header values for cel
	A are. (5 marks)

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Student Name	 Student ID	

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.



Knockout Switching Element

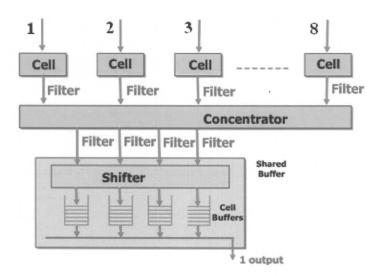


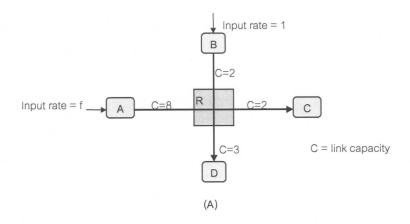
Figure 3 Use the above diagram in answering question no. 4.

4.1	How	many	rows	of cell	buffers	are	required	in	this	Knockout	Switching	Element
	struct	ture? (5	marks	3)								
	•••••			******		••••		••••				••••
			•••••			••••						

Student	Name Student ID
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)

- 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)

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



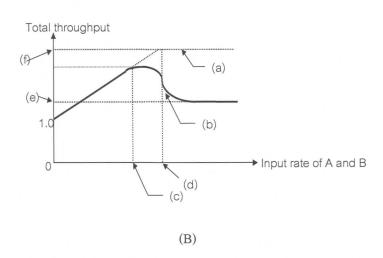


Figure 4 Figure (A) and (B) used for question 5


Student Name	Student ID

6. Explain how EFCI (Explicit Forward Congestion Indication) works, please also shown source node behavior in terms of traffic load.(10 marks)

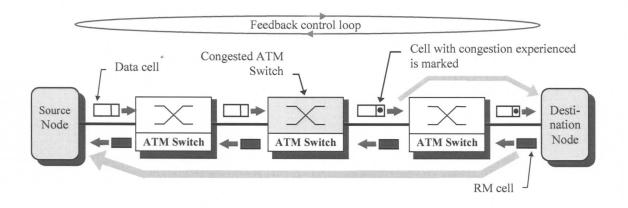
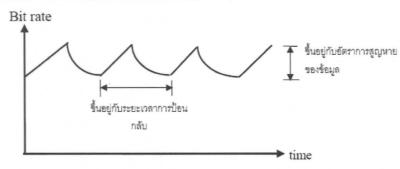


Figure 5 Figure used for question 6

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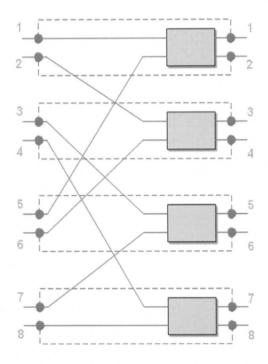
The figure below shows source's rate behaviour.



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 		 •••••

7. The below Figure shows Shuffle exchange network, please draw a switching routed path for input port 2 routed to output port 7 (10 marks)

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



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)

 $T(PCR) = 1 \text{ cell time, } \tau(PCR) = 0 \text{ cell time}$   $T(SCR) = 4 \text{ cell time, } \tau(SCR) = 3 \text{ cell time}$  MBS = 3 cells

(15 marks)

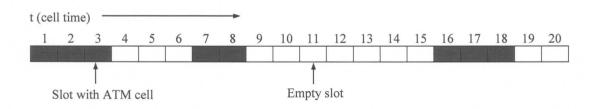


Figure 6 VCR traffic arrival time

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

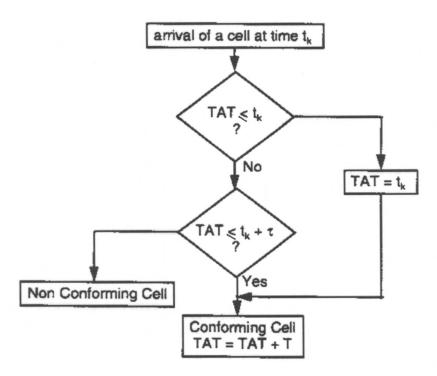


Figure 7 Generic Cell Rate Algorithm

### Your answer (for PCR):

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

#### Your answer (for SCR):

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  $(\beta T \ge M)$  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  $(N \ge M)$ . (10 marks)

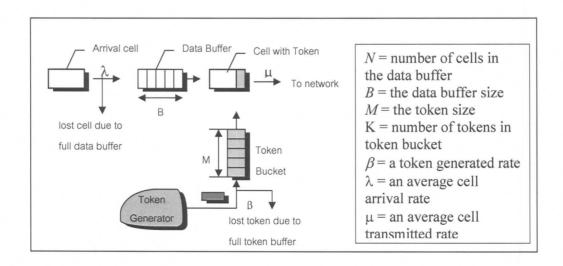


Figure 8 Leaky Bucket with data buffer

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The below figure shows arrival of cells and tokens, please draw transmitted cells in the given time slots. Please also state clearly that what cell numbers will be discarded.

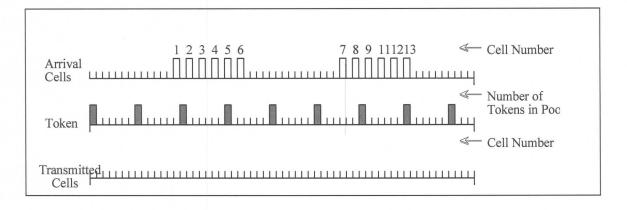


Figure 9 For question 9