

OS 資格考題 (96 年度第二學期)

1. [20%] Four processes, W, X, Y and Z, arrive at a computer at time 2, 3, 0 and 5, respectively. The CPU burst time of them is listed in the following table. Assuming that the system only has a single processor (with a single core) and the context switch time can be ignored, please determine the average waiting time of the processes under the **preemptive SJF** scheduling algorithm.

Processes	Burst Time
W	4
X	2
Y	8
Z	7

2. [20%] Assume that a demand-paging system has 3 page frames, and the size of a **page frame is 10 bytes**. The memory is byte-addressable and the memory reference string is as follows:

Addresses: 70, 01, 12, 22, 01, 30, 02, 40, 22, 30, 02, 30, 22, 12

What are the page fault numbers under the following page replacement strategies?

- (1) [10%] Optimal
- (2) [10%] LRU

3. [20%] The system consists of 5 processes P0 through P4, and 3 resource types A (10 instances), B (5 instances), and C (7 instances).

Snapshot at time T0:

	Allocation	Max	Available
	A B C	A B C	A B C
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 2	4 3 3	

- (1) [10%] Is the system in a safe state? Why or why not?
- (2) [10%] Can request for (1,0,2) by P1 be granted?

4. [10%] What is Belady's Anomaly? Does the FIFO memory replacement algorithm have Belady's Anomaly?

5. [10%] What are the necessary conditions for deadlocks? Use one of the conditions to develop a deadlock-free algorithm.

6. [20%] Describe the three multithreading models (many-to-1, 1-to-1 and 1-to-many) and their advantages.

Dependable Optical Networks (Doctoral Qualification Exam, 2008)

1. Please compare both methods, i.e., “Protection Cycles” and “ p -Cycles”, in terms of redundancy, protection capacity, conceptual, application domain, and special restrictions. (10%)
2. Two rings with dashed lines shown in Fig. 1 can be used to implement enhanced rings or p -cycles. Assuming working capacity in each link is 50%-occupied, please compute the spare redundancy for enhanced rings and p -cycle, respectively. (10%)

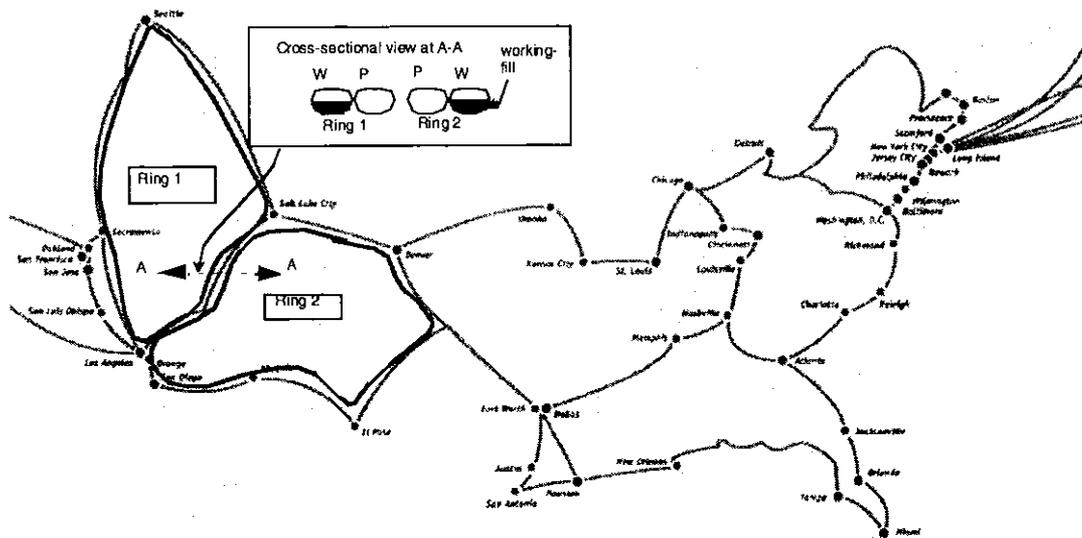


Fig. 1

3. Please depict a figure to describe head-end bridge and tail-end transfer functions in a 1: N Automatic Protection Switching (APS) system, and write pseudo codes of K1-K2 byte protocol involving two finite state machines at each corresponding end of the APS system. (20%)
4. Please show a graphical example to demonstrate BLSR protection switching operation before failure and after failure, respectively. (10%)
5. There are three p -Cycles on the corresponding networks shown in Fig. 2. Please calculate a priori efficiency metric (AE metric) value for each p -cycle. Note that the calculation formula should be according to the equation on Page 796 of the reference book. (10%)

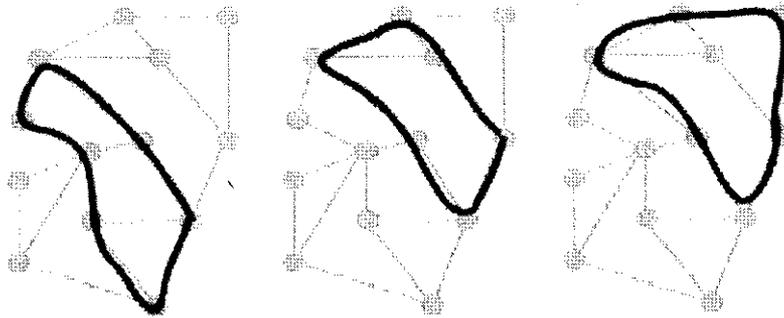


Fig. 2.

6. The following linear programming shows an example of a primal form for the specific optimization problem. Please give its standard primal form and its dual form. (20%)

Primal:

$$\text{minimize } z = 5x_1 - 2x_2$$

subject to

$$-x_1 + x_2 \geq -3$$

$$2x_1 + 3x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

7. Please give the comparative features of four main combinational network optimization techniques in terms of strengths, limitations, keys to effectiveness, code development, and typical best use cases. (20%)