科目：作業系統
考試時間：100 分鐘

系所：
資訊工程學系碩士班
本科原始成績：100 分

是否使用計算機：否

問答題：共 8 題

1. (12%) *read()* is a system call and *fread*() is a standard C library call. (a) Explain how they work in the runtime environment. (b) Discuss their performance issues and indicate in what case one is better than the other.

2. (12%) Consider the following processes, with the arrival time and CPU burst time given in milliseconds.

Process	P1	P2	P3	P4	P5
Arrival Time	0	2	4	6	8
Burst Time	10	26	4	12	8

   For each of the (a) first-come, first-served (FCFS), (b) preemptive shortest job first (SJF), and (c) round robin (RR, quantum = 10 milliseconds) scheduling algorithms for this set of processes, draw the Gantt chart and determine the average waiting time and the average turnaround time.

3. (12%) (a) Explain how to implement mutual-exclusion with hardware-supported *Swap()* instruction. (b) Explain how to implement distributed mutual-exclusion with a ring-based algorithm.

4. (12%) How does the two-phase locking protocol manage locks in the growing phase when an operation accesses an object within a transaction?

5. (12%) In peer-to-peer (P2P) applications a node may act as both a client and a server. There are three common models to implement P2P software: (a) a single-threaded process with non-blocking I/O (b) multiple single-threaded processes with inter-process communication, and (c) a multi-threaded process with shared memory. Discuss strengths and weaknesses of each model.

6. (12%) Flash memory is non-volatile computer memory that is primarily used in memory cards and flash drives for general storage. As its capacity grows, flash drives are commonly equipped as replacement of traditional hard disk drives. (a) In the design of file systems, what are the major features that make flash drives different from hard disk drives? (b) What are the issues if we format a flash drive as a FAT file system?

7. (12%) Consider a number of requests with associated cylinders and deadlines (in milliseconds)

Request	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Cylinder	77	95	25	28	100	90	50	77	12	2
Deadline	57	300	250	88	85	110	299	300	120	212

   The disk head moving within 100 cylinders, numbered 1 to 100, is currently at cylinder 94 and toward cylinder 95. What is the order and the total distance (in cylinders) that the disk arm moves to satisfy all the requests for (a) SCAN disk scheduling, and (b) SCAN-EDF disk scheduling? Assume requests with deadlines occurring within 100 milliseconds of each other will be batched.

8. (16%) Consider the following page reference string
   0, 1, 2, 3, 1, 4, 1, 5, 3, 4, 1, 4, 3, 2, 3, 1, 2, 0, 1, 2
   for a memory with three frames initially empty. How many page faults would occur for the following page replacement algorithms? (a) LRU (b) LFU (c) FIFO (d) optimal