

C3-R3: OPERATING SYSTEMS

NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.

- a) List two salient features of each of the following types of systems:
 - i) Multiprogramming
 - ii) Multiprocessing
 - iii) Time Sharing
 - iv) Real Time Systems
- b) What is the use of shell in the operating system? List various types of shell available in UNIX?
- c) State the advantages of segmentation over paging.
- d) How an access matrix is used for implementing protection policies?
- e) Is mode switching the same as context switching? Give reasons for your answer.
- f) Operating system is also called Resource manager. Why? How are interrupts handled by the operating system?
- g) Explain short-term, medium-term and long-term scheduling.

(7x4)

2.

- a) Explain, how Test and Set Lock instruction provides mutual exclusion for busy waiting.
- b) What is the difference between program and process? Explain various states in the life of a process.
- c) Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4 and 8 minutes. Their (externally determined) priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process-switching overhead.
 - 1) Round robin (Time quantum = 2)
 - 2) Priority scheduling
 - 3) Shortest job first

For (1), assume that the system is multi-programmed, and that each job gets its fair share of the CPU. For (2) and (3), assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound.

(4+5+9)

3.

- a) Explain the term 'Cycle Stealing' in the context of DMA operations.
- b) What is meant by device independent I/O software?
- c) Explain how the "/proc" abstraction has evolved in Linux compared to other Unix implementations.
- d) What do you understand by reentrant code? How does it support sharing?

(2+4+6+6)

4.

- a) Given memory partitions of 100K, 500K, 200K, 300K and 600K (in order). How would each of the First-fit, Best-fit and Worst-fit algorithms place processes of 212K, 417K, 112K and 426K (in order)? Which algorithm makes the most efficient use of memory?
- b) Distinguish between internal fragmentation and external fragmentation. Which of the two is prevalent in paging system?
- c) What is the cause of thrashing? How can the OS reduce the effects of thrashing and improve overall performance?
- d) What is the difference between a block special file and a character special file?

(6+4+4+4)

5.

- a) What is the process scheduling scheme used in Unix?
- b) Consider the following page reference string.
1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2
How many page faults would occur for the following replacement algorithms for five frames?
 - 1) LRU Replacement
 - 2) FIFO Replacement

(6+12)

6.

- a) Differentiate between deadlock detection, avoidance and prevention? Compare each on efficiency, safety and runtime cost parameters.
- b) Disk requests are received by the disk driver for cylinders 10, 22, 20, 2, 40, 6 and 38, in that order. A seek takes 6 msec per cylinder move. How much seek time is needed for
 - 1) First Come First Served
 - 2) Elevator algorithm (initially moving upwards)In both cases, the arm is initially at cylinder 20.

(8+10)

7.

- a) What are the advantages and disadvantages of distributed system over centralized system?
- b) Explain transparency design issue in a Distributed operating system.
- c) How can the storage systems in a computer system be organized in a hierarchy? What is the use of the cache memory? Is it advisable to have more registers instead of the cache memory? Justify.

(6+6+6)