

B.ETCE 3rd YEAR 2nd SEMESTER EXAMINATION

OPERATING SYSTEMS

Session 2024-25

Part A: Answer any 10 questions. All questions carry equal marks (CO1)Marks 10x2=20

1. State the difference between a text file and source file.
2. What is a trap?
3. Define the role of an interrupt.
4. Name the program and list the steps involved for booting the system.
5. What is the name given to the systems when they suffer a failure of any single component and still continue operation?
6. Show the diagrammatic representation of process in memory.
7. State the basic difference between an asymmetric multiprocessing and a symmetric multiprocessing system.
8. What is a Blade Server?
9. What does the API specify?
10. State the characteristics of the Android OS.
11. Show the difference between a single-threaded and a multithreaded process by a diagram.
12. Specify WORM and RW formats for a tertiary storage device.
13. What are the main components of an I/O subsystem?
14. How many page sizes does ARM architecture support?
15. What are solid state disks?

Part B: Answer any 3 questions. (CO2)Marks 10x3=30

1. Describe context switching and highlight its importance in CPU scheduling.
10
2. Draw the process control block. Justify the components of program states that are shared and that are not, across threads in a multithreaded program.
4+6
3. A system with multiple processing cores uses a spinlock or a mutex lock locking mechanisms and has waiting processes sleep while waiting for the lock to be available. Explain which locking mechanism will be used in each of the following cases:
 - a. The lock is to be held for a short duration.
 - b. The lock is to be held for a long duration.
 - c. A thread may be put to sleep while holding the lock.3+3+4

[Turn over

4. Processes P₁, P₂, P₃, P₄ arrive for CPU execution via Shortest Remaining Time First (SRTF) scheduling algorithm.

Processes	Arrival Time(ms)	Execution Time(ms)
i. P ₁	0	10
ii. P ₂	1	13
iii. P ₃	2	6
iv. P ₄	8	9

The processes are assumed to have arrived in the order shown all at time 0.

- Draw the Gantt chart.
 - What is the turnaround time of each process in ms?
 - What is the average waiting time of the processes in ms?
 - Compare the performance of SRTF algorithm with a RR scheduling algorithm with time quantum 4 wrt average waiting time? 4+3+3
5. Illustrate the strategy that a computer user can employ to maximize the amount of CPU time allocated to the user's process, for a system implementing multilevel queue scheduling. 10
6. Consider a system consisting of processes P₁, P₂, ..., P_n, each of which has a unique priority number. Write a monitor that allocates three identical printers to these processes using the priority numbers for deciding the order of allocation.

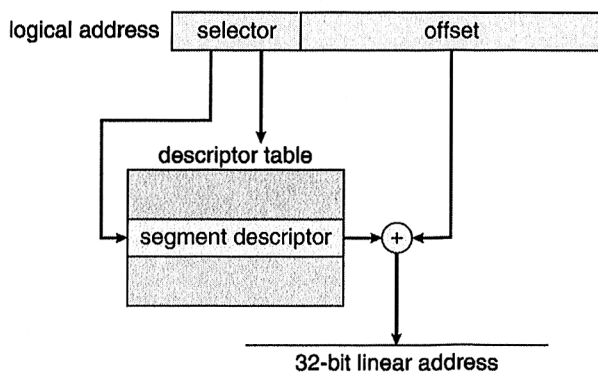
7.

Part C:

Answer any 3 questions.

(CO3) Marks 10x3=30

8. a) Illustrate the steps taken by the Intel Pentium in translating a logical address into a physical address. The address translation scheme is shown below.
b) State the advantages and disadvantages of this scheme.



8+2

9. a) Explain the purpose of paging the page tables.
 b) A computer system supports a logical address space of 2^{32} bytes. It uses two-level hierarchical paging with a page size of 4096 bytes. A logical address is divided into a b -bit index to the outer page table, an offset within the page of the inner page table, and an offset within the desired page. Each entry of the inner page table uses eight bytes. All the pages in the system have the same size. Evaluate b .

4+6

10. Explain the necessity of page replacement policies. Compare the performance of the Optimal Page Replacement algorithm wrt the Least Recently Used algorithm with a suitable example.

2+8

11. Explain thrashing in operating systems. Which page replacement algorithm limits the effects of thrashing? Define the locality model of process execution and illustrate its role to prevent thrashing.

2+2+6

Part D:

Answer any 2 questions.

(CO4) Marks 10x2=20

12. A disk drive has 5000 cylinders numbered 0 to 4999. The drive at present is serving a request at cylinder 2150 while the previous request was at 1805. The queue of pending requests in FIFO order is 2069, 1212, 2296, 2800, 544, 1618, 356, 1523, 4956, 3681. Starting from the current head position, calculate the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for FCFS scheduling algorithm?

10

13. Consider a file system in which a file can be deleted and its disk space reclaimed while links to that file still exist. State problems that may occur if a new file is created in the same storage area or with the same absolute path name. Show how these problems are avoided?

5+5

14. a) If an operating system has the information that a particular application will access data files in sequential manner, show how this prior information will result in improved performance?
 b) Identify an application that could benefit from operating system support for random access to indexed files and illustrate.

6+4

15. a) Explain why SSDs often use a FCFS disk-scheduling algorithm
 b) Illustrate why FCFS is the most fair of the scheduling algorithms and hence show that fairness is an important goal in a time-sharing system.

5+5