

2024

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Paper : OSM : 301 (Old Course)

(Operating System)

Full Marks : 70

Pass Marks : 45%

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 45)

The figures in the margin indicate full marks for the questions

- | | | |
|--------|--|---|
| 1. (a) | Define multi-programmed OS, Multitasking OS and system call. Explain the fork() system call with an example. | 6 |
| (b) | Define operating system and explain the goals of operating system. | 3 |
| Or | | |
| (c) | Explain in detail about operating system services with a neat sketch. | 6 |

- (d) Briefly explain the dual mode of OS (or) transition from user-mode to Kernel-mode with an example.

3

2. (a) Explain medium-term scheduler with a neat sketch and solve the following problem :

Consider that the following processes are scheduling for execution as per below scenarios and apply "FIFO scheduling" on the processes. Draw the Gantt Chart and calculate the average waiting time and turnaround time of processes.

Process ID	Arrival Time	Burst Time
1	2	2
2	4	5
3	2	8
4	5	10
5	1	1

Note :

For all the above scenarios, ties are broken by giving the priority to that process which has lower process id.

6

- (b) Define process and draw the process state diagram.

3

Or

- (c) Consider that the following processes are scheduling for execution as per below scenarios :

Process ID	Arrival Time	Burst Time	Priority
1	3	4	5 (highest)
2	2	10	1 (lowest)
3	3	3	4
4	4	2	3

Note :

For all the above scenarios, ties are broken by giving the priority to that process which has lower process id. Apply priority pre-emptive scheduling on the above process.

Draw the Gantt chart and calculate the average waiting time and turnaround time of processes.

6

- (d) Briefly explain single-threaded and multi-threaded processes with an example and mention any two advantages of threads.

3

3. (a) Explain in detail about simple paging or single-level paging technique with an example.

6

- (b) Consider six memory partitions of sizes 200 kb, 400 kb, 600 kb, 500 kb, 300 kb and 250 kb, where kb refers to kilobyte. These partitions need to be allotted to four processes of sizes 357 kb, 210 kb, 468 kb and 491 kb in that order. If the best fit algorithm is used, which partitions are not allotted to any processes?

3

Or

- (c) Briefly write about the functions of the memory manager and solve the following problem :

6

Consider the reference strings :

(1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5)

Apply optimal and least recently used (LRU) page replacement algorithms/strategies over three page frames and calculate the total number of page faults.

- (d) Write a brief note on virtual memory.

3

4. (a) Define cooperative synchronization. Explain the producer-consumer problem using bounded-buffer shared memory solution in detail.

6

- (b) Write the solutions to critical section problem or requirements of synchronization mechanism.

3

Or

- (c) Define the terms deadlock and starvation. Explain the step-by-step resource request algorithm for banker's algorithm.

6

- (d) Write a short note on deadlock prevention.

3

5. (a) Define file and directory. Explain various directory structures with an example.

9

Or

- (b) Explain about file access methods and disk space allocation methods (or file allocation methods).

2024

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

Paper : OSM : 301 (Old Course)

(Operating System)

(PART : A—OBJECTIVE)

(Marks : 25)

The figures in the margin indicate full marks for the questions

- A.** Choose the most appropriate answer from the given options by putting a Tick (✓) mark in the brackets provided : 1×10=10

1. In the memory hierarchy, at the top most level we are having

- (a) cache memory ()
- (b) main memory ()
- (c) optical disk ()
- (d) registers ()

2. Which of the following is a single-user operating system?

- (a) Windows ()
- (b) MS-DOS ()
- (c) Mac ()
- (d) None of the above ()

3. Identify the incorrect statement from the following.

- (a) Real-time OS used in mission critical applications like rockets, Automobile Industry, ... ()
- (b) UNIX like OS, implement most commands (command interpreter) through system program. ()
- (c) Process control block is kernel data structure. ()
- (d) None of the above ()

4. The processes that are residing in main memory and are ready and waiting to execute are kept on a list called

(a) job queue ()

(b) ready queue ()

(c) execution queue ()

(d) process queue ()

5. Which of the following memory management techniques is free from internal fragmentation?

(a) Segmentation ()

(b) Paging ()

(c) Variable partitioning ()

(d) All of the above ()

6. Listed below are some OS abstractions (in the left column) and hardware components or mechanism (in the right side) that they are abstractions of. Which of the following matching of pairs is correct?

- | | |
|--------------------------|--------------|
| A. Thread | 1. Interrupt |
| B. Virtual address space | 2. Memory |
| C. File system | 3. CPU |
| D. Signal | 4. Disk |

(a) A-2, B-4, C-3, D-1 ()

(b) A-1, B-2, C-3, D-4 ()

(c) A-3, B-2, C-4, D-1 ()

(d) A-4, B-1, C-2, D-3 ()

7. Moving process from main memory to disk in computer terminology is called

(a) scheduling ()

(b) caching ()

(c) swapping ()

(d) spooling ()

8. A system contains three programs and each requires three tape units for its operation. The minimum number of tape units which the system must have such that deadlocks never arise is

(a) 6 ()

(b) 7 ()

(c) 8 ()

(d) 9 ()

9. Page fault occurs

(a) when a requested page is in memory ()

(b) when a requested page is not in memory ()

(c) when page is corrupted ()

(d) when an exception is thrown ()

10. Identify the correct statement from the following.

(a) Dynamic Linking can cause security concerns because linking is insecure. ()

(b) Deadlock avoidance is more restrictive than deadlock prevention. ()

(c) Scheduler process does not interrupt a running process. ()

(d) All of the above ()

B. State whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark : $1 \times 5 = 5$

1. Instructions which are executed at kernel-mode may be pre-empted at any time.

(T / F)

(7)

2. In asymmetric multiprocessing, each processor is following self-scheduling.

(T / F)

3. FIFO page replacement policy suffers from Belady's anomaly for every reference string.

(T / F)

4. To avoid deadlock, there must be a fixed number of resources to allocate.

(T / F)

5. File identifier is a unique tag usually a number identifies the file within the file system.

(T / F)

C . Answer the following questions in short : $2 \times 5 = 10$

(a) Explain layered operating system structure.

- (b) Explain the terms 'semaphore' and 'process control block'.

(c) Define the terms 'thrashing' and 'compaction'.

- (d) What is meant by resource allocation graph?
Why are we using resource allocation graphs in
deadlock situations?

(e) List the various file operations.
