

**OPERATING SYSTEM CONCEPTS
(INFO 3101)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
 - (i) Which of the following scheduling algorithm gives minimum waiting time?
(a) SJF (b) FCFS (c) Round robin (d) Priority.
 - (ii) To avoid the race condition, the number of processes that may be simultaneously inside their critical section is
(a) 8 (b) 1 (c) 16 (d) 0.
 - (iii) The Process Control Block is a
(a) process type variable (b) data structure
(c) secondary storage section (d) block in memory.
 - (iv) Fork means
(a) the dispatching of a task
(b) the creation of a new job
(c) the creation of a new process
(d) increasing the priority of a task.
 - (v) Thrashing
(a) is a natural consequence of virtual memory systems
(b) can always be avoided by swapping
(c) always occurs on large computers
(d) can be caused by poor paging algorithms.
 - (vi) The degree of multiprogramming is
(a) the number of processes executed per unit time
(b) the number of processes in the ready queue
(c) the number of processes in the I/O queue
(d) the number of processes in primary memory.

- (vii) What is a medium-term scheduler?
 - (a) It selects which process has to be brought into the ready queue
 - (b) It selects which process has to be executed next and allocates CPU
 - (c) It selects process to remove which from memory by swapping
 - (d) none of these.
- (viii) Consider a disk queue with requests for I/O to blocks on cylinders:
98 183 37 122 14 124 65 67
Considering SSTF (shortest seek time first) scheduling, the total number of head movements is, if the disk head is initially at 53:
(a) 224 (b) 245 (c) 236 (d) 240.
- (ix) Encryption is the process of

(a) hiding information	(b) authenticating information
(c) all of these	(d) none of these.
- (x) Multithreaded programs are

(a) less prone to deadlocks	(b) more prone to deadlocks
(c) not at all prone to deadlocks	(d) none of these.

Group - B

2. (a) Compare between simple and layered approach in operating system with diagram. What is batch processing system?
(b) Compare among timesharing, real-time, distributed type of operating system.
(4 + 2) + 6 = 12
3. (a) Draw and explain process state diagram. What is cascaded termination and when is this required?
(b) Explain zombie and orphan process with proper code example.
(c) Consider the given C code:

```
main()
{
    int p; p=fork(); p=fork(); p=fork(); ...
}
```

 How many processes will be created if this code is executed? Explain your answer.
(4 + 2) + 3 + (1 + 2) = 12

Group - C

4. (a) Consider the following table of arrival time and burst time for three processes P0, P1 and P2.

Process	Arrival time	Burst Time
P0	0 ms	9 ms
P1	1 ms	4 ms
P2	2 ms	9 ms

The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time for the three processes?

- (b) "Multilevel feedback queue scheduling improves the performance of the system" — explain.
- (c) "FCFS scheduling can be treated as priority scheduling" — justify.
- (d) When does starvation occur in priority scheduling? How can it be solved?
- (e) What is convoy effect? Which scheduling algorithm may undergo this situation?

$$3 + 2 + 2 + (1 + 1) + (2 + 1) = 12$$

5. (a) "Deadlock avoidance is better than deadlock prevention" — explain.
- (b) How does semaphore prioritize reader processes over writer processes to solve "Readers Writers Problem"? Explain with code.
- (c) A system has five processes P1 through P5 and four resource types R1 through R4. There are two units of each resource type. Given that:
P1 holds 1 unit of R1 and requests 1 unit of R4
P2 holds 1 unit of R3 and requests 1 unit of R2
P3 holds 1 unit of R2 and requests 1 unit of R3
P4 requests 1 unit of R4
P5 holds 1 unit of R3 and 1 unit of R2, and requests 1 unit of R3
Show the resource graph for this state of the system. Is the system in deadlock, and if so, which processes are involved?

$$2 + (3 + 3) + (2 + 2) = 12$$

Group - D

6. (a) Differentiate between external and internal fragmentation with example. Suggest any suitable solution for external fragmentation.
- (b) What is the use of valid and invalid bit?
- (c) What is TLB? Discuss the impact of TLB in paging.

$$(3 + 2) + 2 + (2 + 3) = 12$$

7. (a) Derive the formula to calculate the performance of demand paging. What is pure demand paging?

- (b) If the primary memory is divided into four pages and the request sequence of pages is 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1; then using FIFO and LRU page replacement algorithm, what will be the rate of page hit and page miss? What is Belady's anomaly?

$$(3 + 3) + (5 + 1) = 12$$

Group - E

8. (a) What is OTP? How does it work?
- (b) Briefly explain the different file access methods.
- (c) Briefly explain trap door, logic bomb, Trojan horse, virus, worm and zombie.
- (d) How does system manage free spaces in memory?

$$(1 + 1) + 2 + 6 + 2 = 12$$

9. (a) Differentiate between memory mapped I/O and I/O mapped I/O.
- (b) Draw and explain PC bus structure. Differentiate serial and SCSI bus controller.
- (c) Differentiate between interrupt and polling.
- (d) What do you mean by maskable and non-maskable interrupt?

$$2 + (3 + 2) + 3 + 2 = 12$$