OPERATING SYSTEM
(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) Threads under same process:
(a) share Global variables but don't share heap
(b) share both Global variables and heap
(c) don't share Global variables but share heap
(d) don't share both Global variables and heap.

(ii) Which of the following process scheduling algorithm may lead to starvation?
(a) FIFO (b) Round Robin
(c) Shortest Job Next (d) None of these.

(iii) Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6 respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? (Do not count the context switches at time zero and at the end.)
(a) 1 (b) 2 (c) 3 (d) 4.

(iv) Semaphore can't be used for
(a) scheduling multiple copies of similar type resources
(b) maintaining mutual exclusion
(c) maintaining synchronization amongst processes
(d) detecting deadlock .

(v) Thrashing
(a) can always be avoided by swapping
(b) is a natural consequence of virtual memory systems
(c) can be caused by poor paging algorithms
(d) always occurs on large computers.

(vi) Indirect one to one communication between processes is done via-
(a) dedicated message Box owned by the process
(b) shared memory
(c) OS owned message box
(d) none of the above.

(vii) Which feature of the operating system executes several programs concurrently by switching back and forth between them?
(a) Multitasking (b) Partitioning
(c) Paging (d) Windowing.

(viii) The principle of locality of reference justifies the use of
(a) re-enterable (b) virtual memory
(c) cache memory (d) Windowing.

(ix) 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.

(x) Swap space exists in
(a) primary memory (b) secondary memory
(c) CPU (d) none of the mentioned.

Group - B

2. (a) What do you mean by vectored and non vectored interrupt?

(b) State the difference between multiprogramming, multitasking and multiprocessing Operating System.

(c) Differentiate between Hard Real Time System and Soft Real Time System.

(d) What is the basic difference between kernel and shell?

3+ 3 + 3 + 3 = 12

3.(a) Draw and explain process life cycle considering all suspended and active states.

(b) What is thread library? What are the different types of multithreading architectures?

(c) Differentiate between zombie and orphan process using proper example.

5 + (1 + 3) + 3 = 12

Group - C

4. (a) From the given scenario find out which of FCFS, SJF and SRTF will work better with respect to waiting time and turnaround time – (all times are considered in ms)

Process	Arrival Time	CPU Burst Time
P0	7	2
P1	2	3
P2	5	9
P3	2	6
P4	0	12

(b) Write down an algorithm to design the entry and exit sections to support conditions of critical section if n processes are running parallelly in the system. (n≥2).

6 + 6 = 12

5. (a) What are the different types of semaphore?

(b) What is busy waiting? How the wait and signal functions can be redefined to support removal of busy waiting with a better equivalent?

(c) A system has 11 magnetic tape drives and 3 processes: P0, P1, and P2. Process P0 requires 10 tape drives, P1 requires 4 and P2 requires 9 tape drives.

Process	Currently allocated
P0	5
P1	2
P2	2

Find out the safe sequence is there is any. If Process P1 requires 6 tape drives instead of 4, will your answer differ? Explain.

2 + (2 + 4) + (2 + 2)= 12

Group – D

6. (a) What is thrashing? Explain page map table (PMT)with example.

(b) Given the following queue of tracks to be read -- 90, 182, 34, 129, 17, 120, 65, 74 with the Read-write head initially at the track 50 and where the track range is 0-199, find the count of head movements in terms of no of tracks using SSTF and C-SCAN algorithm.

(2 + 4) + (3 + 3)= 12

7. (a) What are the differences between segmentation and paging?

(b) What is swapping? Find the hit and miss ratio considering following references where number of frames are four and the algorithm to be used are FCFS and LRU:7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

4 + (2 + 6)= 12

Group – E

8. (a) Discuss different methods of file accession with example. Explain bit vector method while managing free space in disk.

(b) Discuss how to monitor systems threats. Explain catching and spooling with example.

(3 + 3) + (3 + 3) = 12

9. (a) What is DMA? Explain Cycle stealing DMA.

(b) Discuss different file allocation methods with example.

(2 + 4) + 6 = 12