



Name :

Roll No. :

Invigilator's Signature :

CS/M.TECH (CSE)/SEM-1/MCS-103/2010-11

2010-11

**SYSTEM PROGRAMMING & OPERATING
SYSTEMS**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

Answer **Group-A** and any *five* questions from **Group-B**.

GROUP – A

(Very Short Answer Type Questions)

1. Answer any *five* of the following questions : 5 × 2 = 10
- i) What is a dispatcher ?
 - ii) What do you mean by the context of a process ?
 - iii) What do you mean by dynamic linking ?
 - iv) What are the objectives of code optimization ?
 - v) State the differences between coalescing and compaction.
 - vi) What do you mean by exception handling ?
 - vii) Define thrashing. How can it be solved ?



- viii) "Operating system acts as a resource manager." Justify it.

GROUP – B

(Long Answer Type Questions)

2. a) Discuss on the key criteria that a process-scheduling algorithm should follow.
- b) Consider following set of processes :

| <i>Process</i> | <i>Arrival Time</i> | <i>Service Time</i> |
|-----------------------|----------------------------|----------------------------|
| A | 0 | 3 |
| B | 2 | 7 |
| C | 5 | 3 |
| D | 6 | 4 |
| E | 10 | 3 |

Calculate the finish time, turnaround time and average waiting time for the following algorithms :

- i) FCFS
- ii) Round Robin for time quantum = 2
- iii) Shortest job first. 4 + 8
3. a) Define the critical section problem. Discuss on the key requirements for the solution of a critical section problem.
- b) Explain the bakery algorithm for the solution of critical section problem among n processes.
- c) What are exclusive and non-exclusive locks ? 5 + 5 + 2
4. a) What do you mean by co-operative processes ?
- b) Explain with example pseudo-codes the use of FIFO in inter-process communication.



- c) What is the scenario of inter-process communication where message queue is used ? 2 + 8 + 2
5. a) Explain producer-consumer (Bounded buffer) problem using semaphore.
- b) Explain deadlock modeling using Resource Allocation Graph (RAG) with example.
- c) Explain deadlock avoidance with safe and unsafe states using a suitable example. 5 + 3 + 4
6. a) Compute the number of page faults using LRU page replacement algorithm, when memory reference string is $\langle 5\ 0\ 3\ 1\ 5\ 2\ 1\ 4\ 3\ 2\ 0\ 3\ 0\ 1\ 2\ 0\ 1\ 4\ 5\ 4\ 0\ 5 \rangle$
- Here frame number = 3.
- b) Consider the logical address of an instruction of a process is 2447_d . It will be run on a 16-bit microprocessor. The memory manager uses a two-level paging scheme with page size of 512 bytes. The process uses 4 page tables for execution in 2-level paging scheme. Find out the page table number, page number of the corresponding instruction. If the frame number of that instruction is 15, then what will be the physical address of the instruction ? If the system uses demand paging with a hit ratio 0.9, then what will be the effective memory access time of the system ? Assume that the time overhead of page fault handling = 20 ns and memory access time = 30 ns.

$$6 + (2 + 2 + 2)$$



7. a) "Thrashing under global page replacement is severe." Justify it.
- b) State the working principle of a device controller.
- c) Compare the performance of C_SCAN and SCAN disk scheduling in a system with disk drive having 500 cylinders, numbered as 0 to 499, disk drive is currently serving a request at cylinder 14, disk drive has served previous request at 12, the queue of pending request (in FIFO order) in 9, 147, 91, 177, 95, 150, 102, 175, 13.
- d) State the sequence of events after issuing a page fault interrupt. $3 + 2 (2 + 2) + 3$
8. a) State the 50% rule for memory allocation. How does hole size to process size ratio depend on fragmentation ? Explain it.
- b) "Optimal page replacement provides better result with respect to FIFO and LRU." Justify it.
- c) Consider the sequence of jobs A (30 k), B (165 k), C (250 k), D (78 k), E (184 k) that will be allocated on a 1 MB free memory space. The allocation will be done by the concept buddy system. After the allocation of all five jobs, calculate the external and internal fragmentation. $4 + 4 + 4$
9. Write a short note on the following : 4×3
- a) Hashed inverted page table
- b) Working Set model
- c) Segmentation

d) Overlay.

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