# CS51

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**RAMAIAH**
**Institute of Technology**

(Autonomous Institute, Affiliated to VTU)
(Approved by AICTE, New Delhi & Govt. of Karnataka)
Accredited by NBA & NAAC with 'A' Grade

## SEMESTER END EXAMINATIONS – JANUARY 2020

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| **Program** | : | **B.E. : Computer Science and Engineering** | **Semester** | : | **V** |
| **Course Name** | : | **Operating Systems** | **Max. Marks** | : | **100** |
| **Course Code** | : | **CS51** | **Duration** | : | **3 Hrs** |

**Instructions to the Candidates:**

- Answer one full question from each unit.

### UNIT- I

1. a) Define a system call. Illustrate with an example program, the following system calls. CO1 (08)
   i. Fork() ii. Wait()
   b) "The long term scheduler must select good mixture of I/O bound and CPU bound processes" Justify. CO1 (06)
   c) Differentiate between user mode and kernel mode of operation. CO1 (06)

2. a) With a neat diagram, describe the creation of the process and also explain the different states of the process. CO1 (08)
   b) Consider the following set of processes with a length of the CPU burst time given in milliseconds. CO1 (12)

| Process | Burst Time | Arrival Time |
|---|---|---|
| P1 | 7 | 0 |
| P2 | 2 | 3 |
| P3 | 3 | 4 |
| P4 | 1 | 4 |
| P5 | 3 | 5 |

   i) Draw Gantt charts illustrating the execution of these processes using Round robin( Time slice = 3ms ) and preemptive shortest job first algorithms.
   ii) Compute the turnaround time for each process in each of the scheduling in part i. and average turnaround time.
   iii) Compute the waiting time for each process in each of the scheduling in part i. and average waiting. Time.

### UNIT- II

3. a) Demonstrate memory trace for the following code using paging technique. Assume the necessary data. CO3 (12)
   for (i = 0; i <4; i++) array[i] = 0;
   b) Describe the issues associated with Multilevel Feedback Queue and also provide the solutions for the same. CO2 (08)

4. a) Describe the Multi-level Page Table Control Flow algorithm. CO3 (08)
   b) Illustrate the hybrid approach of memory virtualization with a suitable example. CO3 (06)
   c) Given, an address space of 64-bit and page size 4KB. Assume 4 bytes per page table entry (PTE) and VPN 0 is mapped to PFN 7. CO3 (06)
   Solve the following:
   i) How many numbers of bits for VPN?
   ii) How many entries in page table?
   iii) What is the size of page table?
   iv) Obtain physical address for the virtual address: 2424

**UNIT- III**

5. a) Explain an MIPS TLB entry with a suitable diagram. CO3 (06)
   b) Demonstrate accessing an array of 24 elements using TLB. Assume 16-bit virtual address space, with 8-byte pages. CO3 (08)
   c) Consider a virtual address space of 32KB with code segment from 0KB, heap segment from 10KB and stack segment from 32KB. CO3 (06)
   Following is the mapping for segments into physical memory of 128KB.

| Segment Name | Base | Size |
|---|---|---|
| Code | 20K | 3K |
| Heap | 40K | 4K |
| Stack | 100K | 2K |

   Calculate physical addresses for each of the following virtual addresses
   i) 1033 ii)7168 iii) 31655.

6. a) Illustrate the issue associated with TLB and also provide the solution. CO3 (06)
   b) Consider the following page reference string CO3 (06)
   7,5,4,7,2,1,5,6, 2,1,2,3,7,6,3,2,1,6,5,3 . Calculate the number of page faults using LRU and Optimal page replacement algorithms. Assume no of frames=3.
   c) Describe the Page-Fault Control Flow Algorithm (Hardware) in detail. CO3 (08)

**UNIT- IV**

7. a) Demonstrate how "binary semaphore is used as lock" and also show the traces of threads. CO4 (06)
   b) Discuss on deadlock detection and recovery techniques. CO4 (06)
   c) Describe how deadlock can be handled in the system with single instances of resources. CO4 (08)

8. a) Consider the following snapshot of the system, with 4 types of resources and 3 processes, P1, CO4 (12)
   P2 and P3.
   Available resources vector A: [4 1 0 1]
   Current allocation matrix
   C:
   P1 [3 1 0 0]
   P2 [0 0 1 2]
   Maximum request matrix
   R:
   P1 [3 4 4 0]
   P2 [0 0 1 3]
   P3 [0 2 3 4] P3 [3 3 4 6]
   Answer the following using Banker's algorithm,
   i. What is the existing resource vector for this system?
   ii. Using Bankers algorithm prove what is the current state of the system: safe, unsafe or deadlocked.
   iii. Process P1 requests the following resources [0 1 0 0], and this request is granted. What is the new state of the system: safe, unsafe or deadlocked?
   b) Define readers-writer problem synchronization and also provide the solution (function) for the same. CO4 (08)

**UNIT- V**

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| 9. | a) | With an example show that "implementing journaling technique is more tricky". | CO5 | (06) |
| | b) | Compare FFS standard with parameterized placement technique | CO5 | (06) |
| | c) | Suppose that a disk drive has 200 cylinders numbered from 0-199. The drive is currently serving a request at cylinder 90, the following is the queue of pending requests in FIFO order,<br>178, 47, 96, 52, 136, 172, 15<br>Starting from the current head position, what is the total distance that the disk arm moves to satisfy the pending requests for each of the following disk-scheduling algorithms?<br>i. Shortest Seek Time First<br>ii. C-SCAN | CO5 | (08) |
| 10. | a) | In recovering the file system, if the log is finite and full then identify the problems that may arise and also provide the necessary solutions for the same. | CO5 | (06) |
| | b) | Write a short note on free list and pre-allocation related to free space management. | CO5 | (06) |
| | c) | i) Describe cache consistency problem.<br>ii) Discuss the different crash scenarios that may occur after attempting to write three blocks to the disk. | CO5 | (08) |

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