Seat No.: _____          Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY
## BE - SEMESTER–IV(NEW) EXAMINATION – WINTER 2022

**Subject Code:3141601**                                    **Date:13-12-2022**
**Subject Name:Operating System and Virtualization**
**Time:10:30 AM TO 01:00 PM**                        **Total Marks:70**
**Instructions:**
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

|  |  |  | MARKS |
|---|---|---|---|
| **Q.1** | **(a)** | Describe the four conditions that create deadlock. | **03** |
|  | **(b)** | Differentiate between single threaded and multithreaded process models. | **04** |
|  | **(c)** | Consider the following scenario of processes for Round Robin Scheduling with time quantum 2. | **07** |

| Process | Arrival Time | Execution Time |
|---------|--------------|----------------|
| P1 | 0 | 9 |
| P2 | 1 | 5 |
| P3 | 2 | 3 |
| P4 | 3 | 4 |

Draw the Gantt chart for the execution of processes, showing their start time and end time. Calculate average turnaround time and average waiting time of the processes.
Examine the effect if time quantum is too large and too small.

|  |  |  |  |
|---|---|---|---|
| **Q.2** | **(a)** | Describe the two strategies for providing processor resources in a virtual environment. | **03** |
|  | **(b)** | Describe hardware approaches to mutual exclusion. | **04** |
|  | **(c)** | Consider a disk queue with I/O requests of the following cylinders in their arriving order 6,10,12,54,97,73,128,15,44,110,34,45 The disk head is assumed to be at Cylinder 23 and moving in the direction of decreasing number of cylinders. The disk consists of total 150 cylinders. Calculate the disk head movement using SCAN and C -SCAN scheduling algorithm. | **07** |

**OR**

|  |  |  |  |
|---|---|---|---|
|  | **(c)** | Calculate the number of page faults for the following reference string using LRU(Least recently used) page replacement algorithm with frame size as 3.<br>5 0 2 1 0 3 0 2 4 3 0 3 2 1 3 0 1 5 | **07** |

|  |  |  |  |
|---|---|---|---|
| **Q.3** | **(a)** | Describe characteristics of monitor**.** | **03** |
|  | **(b)** | Write Peterson's solution for achieving mutual exclusion. | **04** |
|  | **(c)** | Write the different states a process can hold. Explain the types of events that lead to each state transition for a process. | **07** |

**OR**

|  |  |  |  |
|---|---|---|---|
| **Q.3** | **(a)** | Segmentation suffers from internal fragmentation or external fragmentation? Justify. | **03** |
|  | **(b)** | In a paging scheme,16 bit addresses are used with a page size of 512 bytes. If the logical address is 0000010001111101, how many bits are used for the page number and offset? What will be the physical address, if the frame address corresponding to the computed page number is 15. | **04** |

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**(c)** Describe the elements which uniquely characterize a process while program is executing. **07**

**Q.4 (a)** Explain how resource allocation graph can depict the deadlock situation? **03**

**(b)** Explain the handling of multiple non interactive and multiple interactive jobs in case of multiprogramming. **04**

**(c)** Distinguish between **07**
    (i)     Static and dynamic allocation of memory
    (ii)    Swapping and paging
    (iii)   Page, frame and segment

**OR**

**Q.4 (a)** Describe the two difficulties with the use of equal size fixed partitions. **03**

**(b)** Explain how input output is managed in virtual environment. **04**

**(c)** Consider the following scenario of processes with priority. If the scheduling of processes is priority based, Draw the Gantt chart. Calculate turnaround time and waiting time for each process. Also compute average turnaround time and average waiting time for the system. **07**

| Process | Arrival Time | Execution Time | Priority |
|---------|--------------|----------------|----------|
| P1 | 0 | 9 | 2 |
| P2 | 1 | 5 | 1 |
| P3 | 2 | 3 | 3 |
| P4 | 3 | 4 | 4 |

**Q.5 (a)** Describe the function of kernel in operating system. **03**

**(b)** Give example of Best fit and worst fit memory allocation strategy. **04**

**(c)** Consider a system with the following information. Determine whether the system is in safe state. If not in safe state, give reasons. If the system is in safe state, find the safe sequence of processes. Consider Need assuming Maximum Allocation. **07**
Total Resources(31)
 Total Resources of R1 type – 15
Total Resources of R2 type – 8
Total Resources of R3 type – 8

| Processes | Max | | | Alloc | | |
|-----------|-----|-----|-----|-------|-----|-----|
| | R1 | R2 | R3 | R1 | R2 | R3 |
| 1 | 5 | 6 | 3 | 2 | 1 | 0 |
| 2 | 8 | 5 | 6 | 3 | 2 | 3 |
| 3 | 4 | 9 | 2 | 3 | 0 | 2 |
| 4 | 7 | 4 | 3 | 3 | 2 | 0 |
| 5 | 4 | 3 | 3 | 1 | 0 | 1 |

**OR**

**Q.5 (a)** Differentiate the preemptive and nonpreemptive scheduling. **03**

**(b)** Describe Linux VServer architecture. **04**

**(c)** Discuss the race condition in producer- consumer problem. Discuss the use of semaphore to solve producer-consumer problem. Also Discuss the solution of producer consumer problem with message passing. **07**

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