Register Number:……..

KUMARAGURU
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**B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023**
(Regulation 2018)
Fourth Semester
**COMPUTER SCIENCE AND ENGINEERING**
U18CSI4202**:** Operating Systems

**COURSE OUTCOMES**

**CO1:** Apply the concepts of CPU scheduling and Process synchronization.
**CO2:** Experiment creation of different virtual machines in a hypervisor.
**CO3:** Simulate the principles of memory management.
**CO4:** Identify appropriate file system and disk organizations for a variety of computing scenario.
**CO5:** Examine the features of various open source operating systems.

**Time: Three Hours** **Maximum Marks: 100**

**Answer all the Questions:-**
**PART A (10 x 2 = 20 Marks)**
**(Answer not more than 40 words)**

| | | | |
|---|---|---|---|
| 1. | Compare Multiprogramming and Multitasking | CO1 | [$K_2$] |
| 2. | Identify the actions taken by a kernel to context-switch between processes. | CO1 | [$K_2$] |
| 3. | What do you mean by Race condition. | CO1 | [$K_1$] |
| 4. | Distinguish between preemptive and non-preemptive Scheduling. | CO1 | [$K_2$] |
| 5. | Consider a paging system with the page table stored in memory. If a memory reference takes 50 nano seconds, how long a paged memory reference take. | CO3 | [$K_3$] |
| 6. | Distinguish between internal and external fragmentation | CO3 | [$K_2$] |
| 7. | Define Belady's anomaly. | CO3 | [$K_1$] |
| 8. | What are the steps required to handle a page fault in demand paging? | CO4 | [$K_2$] |
| 9. | Compare seek time and latency time. | CO4 | [$K_2$] |
| 10. | Illustrate the use of fork() and exec() system call. | CO5 | [$K_2$] |

**Answer any FIVE Questions:-**
**PART B (5 x 16 = 80 Marks)**
**(Answer not more than 400 words)**

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|---|---|---|---|---|---|
| 11. | a) | Illustrate how operating system acts as a resource manager | 8 | CO1 | [$K_2$] |
| | b) | Describe how semaphores are used to solve Readers-Writers problem | 8 | CO1 | [$K_2$] |
| 12. | a) | Consider the following set of processes with the length of CPU- burst time given milliseconds. | 8 | CO1 | [$K_3$] |

| Process | Burst Time | Priority | Arrival Time |
|---|---|---|---|
| P1 | 10 | 3 | 0 |
| P2 | 1 | 1 | 1 |
| P3 | 2 | 3 | 2 |
| P4 | 1 | 4 | 1 |
| P5 | 5 | 2 | 2 |

Draw the Gantt chart for the execution of these processes using SJF (Non – Preemptive), Priority Scheduling (Preemptive) scheduling. Calculate the average waiting time and average turnaround time for each of the above scheduling algorithms. Lower number for priority means high priority

| | | | | | | |
|---|---|---|---|---|---|---|
| | b) | Explain the Monitor solution for dining-Philosopher problem | 8 | CO1 | [K2] |
| 13. | a) | Consider a system that contains five processes P1, P2, P3, P4, P5 and the three resource types A, B and C. Following are the resources types: A has 10, B has 5 and the resource type C has 7 instances. | 8 | CO1 | [K3] |

| Process | Allocation | | | Max | | | Available | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C |
| P1 | 0 | 1 | 0 | 7 | 5 | 3 | 3 | 3 | 2 |
| P2 | 2 | 0 | 0 | 3 | 2 | 2 | | | |
| P3 | 3 | 0 | 2 | 9 | 0 | 2 | | | |
| P4 | 2 | 1 | 1 | 2 | 2 | 2 | | | |
| P5 | 0 | 0 | 2 | 4 | 3 | 3 | | | |

Answer the following questions using the Banker's algorithm:

a) What is Need matrix?

b) Determine if the system is safe or not.

| | | | | | |
|---|---|---|---|---|---|
| | b) | Explain about paging concept | 8 | CO3 | [K2] |
| 14. | a) | Consider the following page reference string.<br>1,2, 3, 4, 2, 1, 5, 6, 2 ,1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6<br>How many page faults would occur for the LRU and Optimal page replacement algorithms. Assume number of frames = 3. | 8 | CO3 | [K3] |
| | b) | Describe about Tree structured directory. | 8 | CO4 | [K2] |
| 15. | a) | Compare indexed and linked allocation methods for disk space allocation. | 8 | CO4 | [K2] |
| | b) | Explain about the components of the Linux system | 8 | CO5 | [K2] |
| 16. | a) | Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67. The head is currently at cylinder number 53 and earlier it has processed the request for cylinder 100. The cylinders are numbered from 0 to 199. Compute total head movement (in number of cylinders) incurred while servicing the requests.<br>a. First Come First Served (FCFS) Algorithm<br>b. C-SCAN Scheduling<br>c. LOOK Scheduling | 9 | CO4 | [K3] |
| | b) | Describe about inverted page table | 7 | CO3 | [K2] |

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