**SRM Institute of Science and Technology**

Mode of Exam

**OFFLINE**

**College of Engineering and Technology**

**School of Computing**

**DEPARTMENT OF COMPUTING TECHNOLOGIES**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

**Academic Year: 2021-2022 (EVEN)**

**Test:** CLAT-2 **Date: 26-5-2022**

**Course Code & Title:** 18CSC205J: Operating systems **Duration:** 2 Period

**Year & Sem:** II & IV **Max. Marks:** 50 Marks

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| Course Outcomes (CO): | | | | | | | *At the end of this course, learners will be able to:* | | | | | | | | | |  |
| CO-2 : | | *Implement synchronization and scheduling in Operating System* | | | | | | | | | | | | | | |
| CO-3 : | | *Apply fragmentation, paging and segmentation in memory management* | | | | | | | | | | | | | | |  |
| Program Outcomes (PO) | | | | | | | | | | | | | |  | | |
| 1 | 2 | | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | 10 | 11 | 12 | PSO | | |
| Engineering Knowledge | Problem Analysis | | Design & Development | Analysis, Design, Research | Modern Tool Usage | Society & Culture | | Environment & Sustainability | Ethics | Individual & Team Work | Communication | Project Mgt. & Finance | Life Long Learning | PSO - 1 | PSO - 2 | PSO – 3 |
| *2* | *1* | | *3* |  |  |  | |  |  |  |  |  |  |  | *2* |  |
| *3* | *2* | | *2* |  |  |  | |  |  |  |  |  |  | *2* |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| **Part - A**  **(10 x 1 = 10 Marks)**  **Instructions: Answer all** | | | | | | |
| **Q. No** | **Question** | **Marks** | **BL** | **CO** | **PO** | **PI Code** |
| **1** | The bounded buffer problem is also known as   1. Readers- Writers problem 2. Producer Consumer problem 3. Dining- Philosophers problem 4. Dining-Readers problem | 1 | L1 | 2 | 3 | 3.5.1 |
| **2** | In the bounded buffer problem \_\_\_\_\_\_\_\_\_\_\_\_ a) there is only one buffer b) there are n buffers ( n being greater than one but finite) c) there are infinite buffers d) the buffer size is bounded | 1 | L1 | 2 | 3 | 3.5.1 |
| **3** | To ensure difficulties do not arise in the readers – writers’ problem \_\_\_\_\_\_\_ are given exclusive access to the shared object. a) readers b) writers and readers c) readers and writers d**)** writers | 1 | L1 | 2 | 3 | 3.5.1 |
| **4** | The dining – philosophers problem will occur in case of \_\_\_\_\_\_\_\_\_\_\_\_ a) 5 philosophers and 5 chopsticks b) 4 philosophers and 5 chopsticks c) 3 philosophers and 5 chopsticks d) 6 philosophers and 5 chopsticks | 1 | L3 | 2 | 3 | 3.7.1 |
| **5** | In the bounded buffer problem, there are the empty and full semaphores that \_\_\_\_\_\_\_\_\_\_\_\_ a) count the number of empty and full buffersb) count the number of empty and full memory spaces c) count the number of empty and full queues d) none of the mentioned | 1 | L3 | 2 | 3 | 3.5.1 |
| **6** | ------------------part of the logical address is used to locate the exact location of the data in a frame in the main memory.   1. Page number 2. Frame number 3. Frame number with offset 4. Page number with offset | 1 | 1 | 3 | 1 | 1.6.1 |
| **7** | -----------occurs when two different processes point to the same physical location in the segmentation table.  a. the segments are invalid  b. the processes get blocked  c. segments are shared  d. no entries are valid | 1 | 1 | 3 | 1 | 1.6.1 |
| **8** | During the compilation, the absolute address gets embedded in the executable code is called \_\_\_\_\_.  a. Load time address binding  b. Compile-time address binding  c. Execution time address binding  d. Both b and c | 1 | 1 | 3 | 1 | 1.6.1 |
| **9** | In which scenario the swap out operation can take place \_\_\_\_\_\_\_\_\_.  **a.** when the process completes its execution  b. when the process waits for I/O operation  c. when the process is not waiting for I/O  operation  d. when the process is using the FCFS  scheduling algorithm | 1 | 2 | 3 | 1 | 1.6.1 |
| **10** | Suppose the process size is 200 MB and where the swapping has a data transfer rate of 50 Mbps. How much time it will take to transfer from main memory to secondary memory.  a. 2000 ms  b. 1000 ms  **c. 4000 ms**  d. 8000 ms | 1 | 3 | 3 | 2 | 2.6.3 |
| **Part – B**  **(4 x 5 = 20 Marks)**  **Instructions: Answer any 4** | | | | | | |
| **11** | Give two reasons why this is a bad implementation for a lock:  lock.acquire() { disable interrupts; }  lock.release() { enable interrupts; } | 5 | L4 | 2 | 3 | 3.6.2 |
| **12** | Design an algorithm for a monitor that implements an alarm clock that enables a calling program to delay itself for a specified number of time units (ticks). You may assume the existence of a real hardware clock that invokes a function tick() in your monitor at regular intervals. | 5 | L5 | 2 | 3 | 3.6.1 |
| **13** | Consider a paging system with the page table stored in memory.   1. If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?   If we add associative registers, and 75 percent of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers takes zero time, if the entry is there ) | 5 | 4 | 3 | 3 | 3.6.1 |
| **14** | Consider the following segment table:   |  |  |  | | --- | --- | --- | | Segment | Base | Length | | 0 | 219 | 600 | | 1 | 2300 | 14 | | 2 | 90 | 100 | | 3 | 1327 | 580 | | 4 | 1952 | 96 |   What are the physical addresses for the following logical addresses?   1. 0,430 2. 1,10 3. 2,500 4. 3,400 5. 4,112 | 5 | 4 | 3 | 3 | 3.7.1 |
| **15** | In a paging scheme, virtual address space is 4 KB and page table entry size is 8 bytes. What should be the optimal page size? | 5 | 4 | 3 | 2 | 2.6.2 |
| **Part – C**  **(2 x 10 = 20 Marks)**  **Instructions: Answer All** | | | | | | |
| **16(a)** | Analyse and develop a graph to detect the possibility of deadlock in the following scenario which has only one instance in each resource. And illustrate the methods that helps to recover from the detected deadlock. | 10 | L5 | 2 | 3 | 3.6.1 |
| **(OR)** | | | | | | |
| **16(b)** | Consider the following set of processes, with the length of the CPU burst given in milliseconds:   |  |  |  | | --- | --- | --- | | Process | Burst Time | Priority | | P1 | 2 | 2 | | P2 | 1 | 1 | | P3 | 8 | 4 | | P4 | 4 | 2 | | P5 | 5 | 3 |   The processes are assumed to have arrived in the order *P*1, *P*2, *P*3, *P*4, *P*5, all at time 0.  a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, nonpreemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2).  b. What is the turnaround time of each process for each of the scheduling algorithms in part a?  c. What is the waiting time of each process for each of these scheduling algorithms?  d. Which of the algorithms results in the minimum average waiting time (over all processes)? | 10 | L5 | 2 | 3 | 3.6.2 |
| **17(a)** | Memory management is in urge to enable more usable memory than held by the computer hardware. There are times when physical memory will be allocated and a process needs additional memory, in such cases describe how these issues can be handled and help the memory management for back storage for further execution, also claim the benefits of the techniques. | 10 | 3 | 3 | 1 | 1.7.1 |
| **(OR)** | | | | | | |
| **17(b)** | Suppose a 16 bit address is used with 4 bits for the segment number and 12 bits for the segment offset so the maximum segment size is 4096 and the maximum number of segments that can be refereed is 16. | 10 | 3 | 3 | 1 | 1.7.1 |

**Course Outcome (CO) and Bloom’s level (BL) Coverage in Questions**

**Approved by the Audit Professor/Course Coordinator**