**SRM Institute of Science and Technology**

Mode of Exam

**OFFLINE**

**SET B**

**College of Engineering and Technology**

**School of Computing**

**DEPARTMENT OF COMPUTING TECHNOLOGIES**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

**Academic Year: 2021-2022 (EVEN) Reg. No.:**

**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 enter\_CS() and leave\_CS() functions to implement critical section of a process are realized using test-and-set instruction as follows:  void enter\_CS(X) {  while test-and-set(X) ;  }  void leave\_CS(X) {  X=0;  }  In the above solution, X is a memory location 1associated with the CS and is initialized to 0. Now consider the following statements:  I. The above solution to CS problem is deadlock-free  II. The solution is starvation free.  III. The processes enter CS in FIFO order.  IV More than one process can enter CS at the same time.  Which of the above statements is TRUE?   1. I only 2. I and II 3. II and III 4. IV only | **1** | **3** | **2** | **3** | **3.6.1** |
| **2** | | Which of the following statements are true with respect to Peterson's Solution to the problem of Critical Section  Statement 1 - can be used in all systems today  Statement 2 - suitable only for two processes  Statement 3- is a Hardware-based Solution  Statement 4 - is a software-based solution  Which of the above statements is TRUE?   1. I and IV only 2. I and II 3. II and IV 4. III and IV only | **1** | **3** | **2** | **3** | **3.6.1** |
| **3** | | An example for atomic execution is   * 1. execution of wait()   2. execution of signal()   3. refinement of non-shared variable   4. execution of wait() and signal() | **1** | **1** | **2** | **3** | **3.6.1** |
| **4** | | Which of the following facility or capacity are required to provide support for mutual exclusion?  i) A process that halts in its noncritical section must do so without interfering with other processes.  ii) Assumption should make about relative process speeds or number of processors.  iii) A process remains inside its critical section for a finite time only   1. i and ii only 2. ii and iii only 3. i and iii only 4. i, ii and iii | **1** | **3** | **2** | **3** | **3.6.1** |
| **5** | | A counting semaphore was initialized to 14. Then 6P (wait) operations and 4V (signal) operations were completed on this semaphore. The resulting value of the semaphore is   * 1. 0   2. 8   3. 10   4. 12 | **1** | **3** | **2** | **3** | **3.6.1** |
| **6** | | -------------contributes to the degree ofmultiprogramming in fixed-size partitioning.  a. the number of partitions  b. the CPU utilization  c. the memory sizes  d. size of the process | **1** | **1** | **3** | **1** | **3.6.1** |
| **7** | | Instructions and data in a process can be bound to the memory address space during---time.   1. Compilation and execution 2. Loading and execution 3. Compilation and loading 4. Compilation, loading, and execution | **1** | **1** | **3** | **1** | **1.6.1** |
| **8** | | The other name of the base register is called as   1. Absolute register 2. Storage register 3. Relocatable register 4. Regular register | **1** | **1** | **3** | **1** | **1.6.1** |
| **9** | | -----------consumes more time in swapping outa completed process and swapping in a new process into the memory.  a.context switching  b. waiting  c. execution  d. loading | **1** | **1** | **3** | **1** | **1.6.1** |
| **10** | | ----------- and ------------ are the fixed-size blocks in the physical memory and logical memory.   1. frames, pages 2. Pages, frames 3. Segments, frames 4. Frames, segments | **1** | **1** | **3** | **1** | **1.6.1** |
| **Part – B**  **(4 x 5 = 20 Marks)**  **Instructions: Answer any 4** | | | | | | | |
| **11** | Explain why the following lock does not work? Locked is a Boolean which indicates the lock is currently locked. Also describe a hardware assisted solution, how does it solve this problem?  while (locked) {  // do nothing  }  locked = TRUE; | | **5** | **4** | **2** | **3** | **3.7.1** |
| **12** | The semaphores wait and signal operations are defined as indivisible (or atomic) operations. Why do they have to be indivisible? Because they are indivisible does that mean that all other processes running on a multiprocessor system must stop when a wait or signal operation is executed? Explain why or why not. | | **5** | **4** | **2** | **3** | **3.7.1** |
| **13** | Sharing segments among processes without requiring that they have the same segment number is possible in a dynamically linked segmentation system. a. Define a system that allows static linking and sharing of segments without requiring that the segment numbers be the same. b. Describe a paging scheme that allows pages to be shared without requiring that the page numbers be the same. | | **5** | **4** | **3** | **3** | **3.6.4** |
| **14** | Why is that, on a system with paging, a process cannot access memory it does not own? How could the operating system allow access to other memory? Why should it or should it not? | | **5** | **3** | **3** | **1** | **1.7.1** |
| **15** | Fill in the blanks(priority of the processes)    Out of five processes, process1 takes priority “1” and process 5 takes priority “4”. Find the suitable priority for the remaining processes among 2,3 and 5, in order to achieve the average waiting time “11”. | | **5** | **5** | **2** | **3** | **3.6.2** |
| **Part – C**  **(2 x 10 = 20 Marks)**  **Instructions: Answer All** | | | | | | | |
| **16 [a]** | There are 5 processes P0, P1, P2, P3 & P4 in a system and 4 resource types A, B, C & D. There are 5 instance of A, 12 instance of B, 11 instance of C and 10 instance of D are available. The resources allocated to each process and the maximum resources required by each process are given in in the following table.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | Allocation | | | | Maximum | | | | | A | B | C | D | A | B | C | D | | P0 | 0 | 0 | 1 | 2 | 1 | 1 | 1 | 2 | | P1 | 0 | 2 | 0 | 0 | 0 | 7 | 3 | 0 | | P2 | 1 | 3 | 5 | 2 | 2 | 3 | 7 | 4 | | P3 | 0 | 0 | 3 | 1 | 4 | 0 | 5 | 8 | | P4 | 1 | 0 | 1 | 4 | 5 | 5 | 5 | 5 |   Using Bankers algorithm generate the sequence of process for which the system is in safe state.  **[OR]** | | **10** | **5** | **2** | **3** | **3.6.2** |
| **16 [b]** | Consider a scenario where the following processes are arriving in the given time and their CPU burst is given in the milliseconds    Which of the following algorithm would be more suitable for this given scenario to yield best average waiting and average turnaround time?   1. Shortest remaining time first 2. Shortest job first   Justify your answer whether the preemptive scheduling or non-preemptive scheduling work well for this case. And also specify the difference in the average waiting time by those two algorithms. | | **10** | **5** | **2** | **3** | **3.6.4** |
| **17 [a]** | Explicate the simplest technique used to load more than one processes into the main memory, which helps to split into equal or different sizes of the memory. The operating system always resides in the first half or split while the other partitions can be used to store user processes. The memory is assigned to the processes in contiguous way; demonstrate with suitable examples and diagrams.  **[OR]** | | **10** | **2** | **3** | **1** | **1.7.1** |
| **17 [b]** | Associate the technique used for Structuring the page table,  Case 1: There might be a case where the page table is too big to fit in a contiguous space may have a hierarchy with several levels.  Case 2: Identify the approach is used to handle address spaces that are larger than 32 bits. | | **10** | **2** | **3** | **2** | **2.6.2** |

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

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