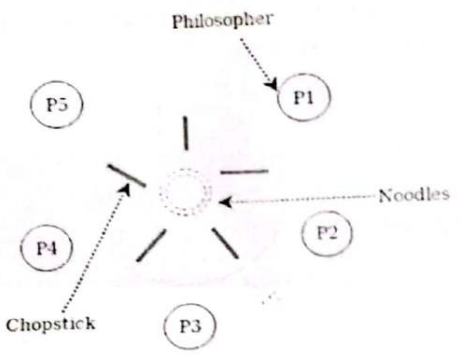
# Daffodil International University

**Faculty of Science & Information Technology**
**Department of Computer Science & Engineering**
**Final Semester Examination, Fall 2024**
**Course Code: CSE 323, Course Title: Operating Systems**
**Level: 3 Term: 2 Batch: 61**

**Time: 2:00 Hrs** **Marks: 40**

**Answer ALL Questions [Optional]**

***[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]***

| | | | | |
|---|---|---|---|---|
| **1.** | ***a)*** | Five philosophers are sitting at a circular dining table.<br>  <br><br>**Explain** the above problem with pseudocode. **List** the synchronization challenges of this problem. | **[5]** | **CO2** |
| | ***b)*** | **Inspect** the solution steps for handling those challenges of the above problem with appropriate diagram. | **[3]** | |
| **2.** | ***a)*** | | **[4]** | **CO3** |

| Process | Allocation | Max |
|---|---|---|
| Po | 0 1 0 | 7 5 3 |
| P1 | 2 0 0 | 3 2 2 |
| P2 | 3 0 2 | 9 0 2 |
| P3 | 2 1 1 | 2 2 2 |
| P4 | 0 0 2 | 4 3 3 |
| P5 | 3 4 5 | 5 4 7 |

Given a set of processes and three types of resources with the allocation matrix and maximum request matrix of every process. Available resources are: [3, 3, 2]. **Identify** if the system is in a safe state or not. If so, provide the safe sequence of executing the processes.

| | | | | |
|---|---|---|---|---|
| | ***b)*** | If Process **P1** requests additional resources [1, 0, 2] in the problem stated in 2(a), **identify** the updated safe sequence of executing the processes if applicable. | **[4]** | |

**3.** ***a)*** The following jobs are to be loaded into memory using fixed partitioning. **[4]** **CO3**

| Job | Size | Turnaround |
|---|---|---|
| Job 1 | 20k | 1 |
| Job 2 | 85k | 3 |
| Job 3 | 40k | 2 |
| Job 4 | 12k | 1 |
| Job 5 | 50k | 2 |
| Job 6 | 75k | 3 |
| Job 7 | 30k | 1 |
| Job 8 | 95k | 3 |

| Block | Size |
|---|---|
| Block 1 | 45k |
| Block 2 | 100k |
| Block 3 | 60k |
| Block 4 | 80k |

At each cycle 4 jobs can be allocated in the memory blocks. **Solve** the problem using Worst Fit memory allocation method.

***b)*** **Identify** the problem arises in the memory allocation method stated in 3(a) and **choose** the solution of it. **[4]**

**4.** ***a)*** Given a sequence of page references, a number of available frames, and the following page replacement algorithms:
[1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6] **[4]** **CO3**

**Apply** FIFO page replacement algorithm to determine the number of page faults with frame sizes 2, 3 and 4 and **construct** the graph (page faults vs frame size) to visualize Belady's anomaly.

***b)*** The system's memory is divided into fixed-size pages, with each process allocated 6 pages. The page table for a customer's session contains the following entries: **[7]** **CO4**

| Logical Page Number | Frame Number |
|---|---|
| 0 | 3 |
| 1 | 2 |
| 2 | 1 |
| 3 | 0 |
| 4 | 7 |
| 5 | 6 |

The system's page size is **16 bytes**. Logical address space is 512 bytes and physical address space is 256 bytes. Given the following logical addresses: 5, 130, 210, 300. **List** the physical addresses using the page table provided and the steps in handling those page faults with appropriate diagram.

**5.** ***a)*** A large organization's server experiences high disk I/O requests due to simultaneous access from multiple users. Given a queue of requests: 2, 45, 93, 183, 37, 16, 127, 67, 153, 217, 10, 239, an initial head position at 73 and a disk of 250 cylinders (0–249). Assume each cylinder traversal takes 0.25 milliseconds. **Compare** each disk scheduling algorithm's ( SSTF, LOOK and C-LOOK) impact on access time and total head movement, apply decreasing order procedure. **[5]** **CO4**



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