



## COMSATS University Islamabad, Lahore Campus

☐ Sessional-1    ☒ Sessional-II    ☐ Terminal Examination    **FALL 2020**

|                      |                       |        |  |                 |                     |               |            |
|----------------------|-----------------------|--------|--|-----------------|---------------------|---------------|------------|
| Course Title:        | Operating Systems     |        |  | Course Code:    | CSC322              | Credit Hours: | 3          |
| Course Instructor/s: | Dr. Hasan Jamal       |        |  | Programme Name: | BS Computer Science |               |            |
| Semester:            |                       | Batch: |  | Section:        |                     | Date:         | 03/12/2020 |
| Time Allowed:        | 1 Hour and 10 minutes |        |  | Maximum Marks:  |                     | 25            |            |
| Student's Name:      |                       |        |  | Reg. No.        |                     |               |            |

### Important Instructions / Guidelines:

- Fill in the exam sheet given and submit it on Google Classroom. No extra attachment is required/allowed.
- Show all your work, as partial credits will be given. You will be graded not only on the correctness of your answer, but also on the clarity with which you express it. Please be neat.
- In case of late submission, one mark will be deducted for each minute over the submission deadline
- Any solution found to be copied would strictly result in zero marks
- **Good luck!**

### Question 1:

**[Marks: = 10]**

In the table given below, write the pseudocode to synchronize processes P1, P2, P3, P4, P5, and P6 by using semaphores so that process P3 must finish executing before P1 and P4 starts, process P6 must start executing after completion of P2 and P5, and process P2 and P4 must start after completion of P1. You should assume three semaphores X, Y and Z are initialized as follow: X=0, Y=0, Z= -1.

| P1            | P2            | P3            | P4            | P5            | P6            |
|---------------|---------------|---------------|---------------|---------------|---------------|
| Do work of P1 | Do work of P2 | Do work of P3 | Do work of P4 | Do work of P5 | Do work of P6 |

### Question 2:

**[Marks: 10]**

Is the following system in a safe state, under banker's algorithm? If so, show a safe order in which the processes can run. (Draw tables like the one below to show how the system can complete or where the failure occurs.)

|    | Maximum |    |    |    |    |    | Allocation |    |    |    |    |    | Available |  |
|----|---------|----|----|----|----|----|------------|----|----|----|----|----|-----------|--|
|    | P1      | P2 | P3 | P4 | P5 |    | P1         | P2 | P3 | P4 | P5 |    |           |  |
| R1 | 7       | 6  | 5  | 2  | 1  | R1 | 0          | 3  | 4  | 1  | 0  | R1 | 1         |  |
| R2 | 5       | 6  | 1  | 2  | 4  | R2 | 1          | 0  | 1  | 0  | 3  | R2 | 1         |  |
| R3 | 2       | 4  | 4  | 2  | 1  | R3 | 1          | 1  | 2  | 2  | 0  | R3 | 1         |  |

### Question 3:

**[Marks: 2 + 3 = 5]**

In not more than four lines each, answer the following short questions.

- Why is thread called a light-weight process?
- Which is more expensive when considering context switching between processes and context switching between threads? Why?