

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-2 EXAMINATION - April 2022

B.Tech-IV Semester (CSE&IT)

COURSE CODE: 18B11CI411

MAX. MARKS: 25

COURSE NAME: Operating Systems

COURSE CREDITS: 3

MAX. TIME: 1 Hour 30 Min

Note: All questions are compulsory. Marks are indicated against each question in square brackets. Write all steps of solution in detail.

Q1. Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units, respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does the CPU remain idle? **[CO3][4 Marks]**

Q2. Consider the set of processes with arrival time (in milliseconds), CPU burst time (in milliseconds), and priority (0 is the highest priority) shown below. None of the processes have I/O burst time.

Process	Arrival time	Burst Time	Priority
P1	0	11	2
P2	5	28	0
P3	12	2	3
P4	2	10	1
P5	9	16	4

Compute the average waiting time (in milliseconds) of all the processes using preemptive priority scheduling algorithm? **[CO3][4 Marks]**

Q3. Consider two processes P1 and P2, where $p_1 = 50$, $t_1 = 25$, $p_2 = 75$, and $t_2 = 30$. Illustrate the scheduling of these two processes using earliest deadline-first (EDF) scheduling with the help of Gantt chart. **[CO3][4 Marks]**

Q4. How mutual exclusion is preserved in Peterson's Solution? Further, explain how reordering of instructions in the entry section can adversely affect Peterson's Solution. **[CO4][1.5+1.5=3 Marks]**

Q5. Illustrate how `test_and_set()` instruction can be used to preserve mutual exclusion condition using a shared variable 'lock' initialized to 0. **[CO4][3 Marks]**

Q6. A counting semaphore was initialized to 10. Then 3 P (Wait) operations, 2 V (Signal) operations, 4 P (Wait) operations and 3 V (Signal) operations were completed on this semaphore. Compute the resulting value of the semaphore. **[CO4][3 Marks]**

Q7. The readers-writers problem relates to an object such as a file that is shared between multiple processes. Some of these processes are readers i.e. they only want to read the data from the object and some of the processes are writers i.e. they want to write into the object.

Write a semaphore based solution to the readers-writers problem along with the explanation of key variables and statements in the solution. **[CO4][4 Marks]**

T2 Examinations April 2022