SPRING MID SEMESTER EXAMINATION-2023

School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Operating System
[CS2002]

Time: 1 1/2 Hours   **Full Mark: 20**

Answer any four Questions including Q.No.1 which is Compulsory.
The figures in the margin indicate full marks. Candidates are required to give theiranswers in their own words
as far as practicable and all parts of a question should beanswered at one place only.

1.   Answer all the questions.   [1 x 5]

   a) What is the difference between a thread and a process?

   b) "Medium term scheduler maintains the degree of multi programming"- true or false? Justify your answer.

   c) What are the difference between multiprocessing and multi-programming?

   d) The monitor construct ensures that _____

       I.   only one process can be active at a time within the monitor

       II. n (< 1) number of processes can be active at a time within the monitor

       III.   the queue has only one process in it at a time

       IV.   all of the above

   e) Is it possible that the response time of all the process is equal to their waiting time in preemptive scheduling algorithm? Give a reason.

2. Use Preemtive Priory Scheduling with aging technique to calculate average waiting time, average response time, and average turnaround time of the processes as given bellow. The range of the priority starts from 1 to 10, where 1 is the high priority and 10 is the low priority. Here, the criteria for aging technique is that the priority of a process will be increased by one, if a process continuously waits in the ready queue for every 2 units of time. (For example, let a process enters into ready queue at time 11 with priority 6 and waits in the ready queue till 13. As it has stayed continuously in the ready queue for 2 units, so, at time 13, its priority changes from 6 to 5. If it waits in the ready queue continuously till 15, then its priority changes from 6 to 4 and so on.)   [5 Marks]

Process	CPU Burst Time	Arrival Time	Priority
P1	2	7	5
P2	6	0	7
P3	3	4	5
P4	5	5	4
P5	4	8	3

3. There is a small dental clinic with one dentist and one chair for the patient inside the clinic. Five chairs are kept outside the clinic for the waiting patients. Assuming the dentist comes ahead of any patient, write a synchronization solution using semaphore for handling the following situation.

   a) If there is no patient, the dentist has to wait for the patient.

   b) In case there is no patient, if a new patient arrives then he is allowed to go inside the clinic.

   c) If there are patients waiting outside of the clinic, then the patient has to wait provided there are empty chairs or else he has to leave the clinic.

   [5 Marks]

4. There are five threads (T1, T2, ... T5) which are calling INCR( ) and there are three threads (P1, P2, P3) which are calling DECR( ) for the code given below:

Statement Number	INCR( )	Statement Number	DECR( )
1	wait(s);	1	wait($mutex$);
2	$x = x+1$;	2	$y = y-1$;
3	signal(s);	3	signal($mutex$);

Shared integer variable x initialized with 10 and shared variable y initialized to 5. Find the following with justification:
   i.   Minimum and Maximum possible value of x for binary semaphore $s = 1$
   ii. Minimum and maximum possible value of y for counting semaphore $mutex = 2$.

   [5 Marks]

5. (a) While executing a *printf* function call execution on a typical processor, explain the steps of how the processor switches between:

   i) user mode to privileged mode (kernel mode)

   ii) privileged mode to user mode   [3 Marks]

   (b) Explain the working procedure of the process control block (PCB)   [2 Marks]

*** Best of Luck ***