Department of Computer Science & Engineering, NIT Rourkela

Subject: Operating System Design(CS 334) Mid Term Exam 2016

Answers must be to the point. Unnecessary long answers may attract **negative mark**.

Full Marks: 30 Time: 2 Hours

Attempt all questions

1. (a) How does HRRN decrease the favoritism shown by other CPU scheduling methods (*i.e. SJF, SRTF*) to short new jobs?
   (b) Some implementation of semaphore may not satisfy *bounded waiting* condition. However, the implementation satisfies other constraints. Give your opinion in favor of this statement.
   (c) Can the execution of two atomic instructions be interleaved? Can the execution be overlapped?

   $[2 \times 3]$

2. Using Definition 1 categorize following CPU scheduling methods either in *fair* policy or *non-fair* policy.

   FIFO, SJF, Multilevel Feedback Queue, HRRN. Explain your answers.

   Definition 1 (Fair Policy) *A scheduling method is called* fair *if all processes are treated the same, and no process can suffer indefinite postponement.* [4]

3. Describe the steps need to be followed in any system call. [2]

4. Define general (counting) semaphore. The classical bounded-buffer producer-consumer problem can be synchronized using following general semaphores.
   semaphore $n = 0, s = 1, e = \#size\_of\_the\_buffer$;

   Producer (P): while(1) { wait(e); wait(s); append(); signal(s); signal(n);}
   Consumer(C): while(1) { wait(n); wait(s); consume(); signal(s); signal(e); }

   If producer (P) and consumer (C) execute in the following order and scenarios.

   (a) P executes all five statements once and it is interrupted while executing **append()** in 2nd time. Consumer C_1 starts its executions and interrupted while executing 2nd statement (**wait(s);**). What will be the process state of the P and C_1? What will be the value of the semaphores?
   (b) Having completed the first case, P gets CPU and completes next two statements (**signal(s); signal(n);**); Consumer C_2 gets CPU and execute 1st statement (**wait(n);**). What will be the process state of the P, C_1 and C_2 ? What will be the value of the semaphores?

   $[2 + 3 + 3]$

5. What is difference between thread and process? [2]

6. What is the turnaround time of each process (Table 1) for SJF and SRTF CPU scheduling algorithms? Assume that context switching time is 1 millisecond. [3]

Table 1:

Process	Burst Time (in millisecond)	Turn Around (SJF/SRT)
P_1	10	23
P_2	1	1
P_3	2	6
P_4	1	3
P_5	5	12

7. Algorithm 1 is the structure of a process $P_{i_{0..1}}$. Can the Algorithm be a solution to critical section problem for two processes. Verify all the requirements. [5]

Global Variables:
boolean flag={False, False};
int turn= 0;

Algorithm 1 $P_i()$

```
1:  /** j = 1 − i **/
2:  while (1) do
3:     flag[i]=True ;
4:     while (flag[j]) do
5:        if (turn== j) then
6:           flag[i] =False;
7:           while (turn== j) do
8:              ; /***DO NOTHING****/
9:           end while
10:          flag[i] =True;
11:       end if
12:    end while
13:
14:    <Critical Section>
15:
16:    turn = j; flag[i] =False;
17: end while
```