



Midterm Examination – Semester Fall 2021

Course Title:	Operating Systems	Course Code:	CSC322	Credit Hours:	3(2,1)
Course Instructor/s:	Nadeem Ghafoor Chaudhry; Zeenat Afzal	Programme Name:	BS SE; BS Comp Eng		
Semester:	5 <sup>th</sup>	Batch:	FA19-BSE & BCE	Section:	A&B
				Date:	Friday, Nov 19, 2021
Time Allowed:	90 Minutes	Maximum Marks:	25		
Student's Name	Adil Hashmi	Reg. No.	FA19-BSE-110		

Important Instructions / Guidelines:

- Attempt all questions.
- Do not write anything other than your name and registration number on question paper.
- Do not give multiple answers for any question. Clearly cross out what you do not want me to read.
- Give brief but to the point answers, length of your answer is not a good predictor of your expected marks.
- You may attempt questions in order of your liking but answer all parts of a question in sequence, i.e don't write the answer of part d of question #1 after question #3. I will not mark it.

**Part A**

Q1) [2\*2.5=5 marks]

Give brief answers to the following:

- a) Modern CPUs have two execution modes, i.e kernel mode and user mode, why we need these two modes?
- b) What is a Virtual Machine and what are its benefits, give an example?

Q2) [2 + 8=10 marks]

- a) Anonymous pipes and shared memory are two mechanisms for inter process communication, compare the two.
- b) Consider the following five processes

Process	Burst Time (ms)	Priority	Arrival time (ms)
P1	4	3	0
P2	9	1	1
P3	7	4	3
P4	3	2	4
P5	5	5	7

Draw Gantt charts and calculate the average waiting time for First Come First Serve, Shortest Job First, and Priority based (non- preemptive) algorithms. Figure out which algorithm gives the best average waiting time in the above scenario. (Note: All times are in milliseconds.)

T.M.  
Raj

## Part B

Q3) [2+1+4+3=10 marks]

- What are the three requirements for solution to critical-section problem? Give brief description of any two.
- Why Peterson's Solution does not work on modern architecture and what is the solution to it?
- Given below is the pseudocode to synchronize processes P1, P2, P3, P4, P5, and P6 by using three semaphores X, Y and Z that are initialized as follow: X=1, Y=1, Z=0. The Operating System can schedule the processes which are ready to execute in any order. List down at least 4 legal possible orders of execution in which the processes can run.

P1	P2	P3	P4	P5	P6
Wait(Z) Print P1	Wait(Y) Print P2 Signal(Z)	Wait(X) Print P3 Signal(Y)	Wait(Z) Print P4 Signal(X)	Wait(Y) Print P5 Signal(Y)	Wait(Y) Print P6 Signal(Z)

- Review the following code and argue if it meets all the requirements of critical-section solution.

```

while (true)
{
    waiting[i] = true;
    key = 1;
    while (waiting[i] && key == 1)
        key = compare_and_swap(&lock, 0, 1);
    waiting[i] = false;
    /* critical section */
    j = (i + 1) % n;
    while ((j != i) && !waiting[j])
        j = (j + 1) % n;
    if (j == i)
        lock = 0;
    else
        waiting[j] = false;
    /* remainder section */
}
    
```

X-2-1.

Y-1-0-1-0-10

Z-0-1-2-1.

X-1-0-1

Y-1-2-1-2-1

Z-0-1-0-1

X-1-2-1.

Y-1-0-1-2-1

Z-0-1-0-1-0

X-1-2-1-0

Y-1-0-1-0-0

Z-0-1-0-1-0