United International University
Department of Computer Science and Engineering

CSI 309: Operating System Concepts Mid-term Examination : Spring 2018

Total Marks: 30 Time: 2 hours

Answer all the 5 questions. Numbers to the right of the questions denote their marks.

1. (a) What is *system call*? Write down the steps of making a *system call*. (1+2)

   (b) Draw process hierarchy for the following code. What will be the output of this code? (1.5+1.5)

```
int main() {
fork();
printf("First fork \n");
fork() || fork();
fork();
printf("Other fork\n");
return 0;
}
```

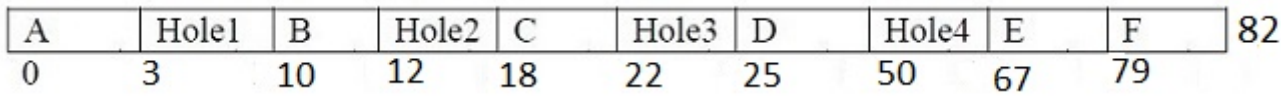
2. (a) When does a process go to ready state from running state? (1)

   (b) Processes allow an OS to execute several tasks at the same time. Why was it important to introduce threads in addition to processes? (2)

   (c) What are the cases when you will prefer using kernel thread over user level thread although you know context switching of kernel thread is costly compared to user level thread? Why? (3)

3. (a) How does dynamic relocation solve **"Protection"** problem that occurs in no memory abstraction approach? Mention one drawback of dynamic relocation. (1+1)

   (b) Assume a system with 82 unit memory has memory allocation as shown below. Here values below the figure indicates starting index of each process/hole. Show linked list representation of the memory for the figure below. (1)



   (c) Which hole is taken for successive segment request of 10, 8 and 16 units for Worst fit and Next fit for the memory allocation shown above? (1.5+1.5)

4. (a) Define modify bit and present/absent bit. (1)

   (b) Determine physical addresses for the following logical addresses using the page table given below. Indicate page fault where the desired page is not present in memory. (2)

   i. 10001010
   ii. 01011111

	PPN	Present/Absent bit
7	10	0
6	01	1
5	00	1
4	00	0
3	11	1
2	10	1
1	10	0
0	00	0

(c) Suppose, there are three page frames in memory. Show which pages reside in memory at each memory reference for the following sequential memory access using LRU page replacement algorithm. (2)

2, 1, 4, 3, 5, 2, 3, 1

(d) Determine the number of physical pages if virtual address is 32 bits, physical address is 30 bits and number of virtual pages is 64. (1)

5. (a) Define all the performance metrics used for scheduling. (1)

(b) What is convoy effect? Briefly explain. (1)

(c) For the process arrival time chart below, draw the Gantt chart and average turnover time using FCFS, and preemptive SJF algorithms. (2+2)

Process	Arrival Time (sec)	Duration (sec)
A	0	7
B	2	4
C	4	1
D	5	4