United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

***Midterm Exam*: Trimester: Summer 2018**

Course: CSI 309, Operating System Concepts

Marks: 30, Time: 1 hour 45 minutes

Figures in the right-hand margin indicate full marks.
Answer all the questions.

1. (a) What are the two different ways for sharing resources? Provide an example of each. [2]
(b) Explain the steps of making a system call. Draw necessary figure(s). [3]

2.(a) Draw the process state transition diagram and briefly explain it [2.5]
(b) Draw the process tree for the following code snippet: [2.5]

```
int main(){
    for(int i = 0; i < 2; i++){
        fork();
    }
    return 0;
}
```

3. (a) The memory holds several processes and holes in the manner as depicted in the following figure: [3]

Process 1 (5 Allocation Unit)	Hole 1 (4 Allocation Unit)	Process 2 (4 Allocation Unit)	Hole 2 (3 Allocation Unit)

Draw Bitmap and Linked List representation for the above memory pattern. Suppose, leftmost allocation unit is on location 0.

(b) The memory holds several processes and holes in the manner as depicted in the following figure: [2]

Process 1 (5 Unit)	Hole 1 (15 Unit)	Process 2 (5 Unit)	Hole 2 (22 Unit)	Process 3 (5 Unit)	Hole 3 (7 Unit)	Process 4 (5 Unit)	Hole 4 (9 Unit)

Allocate memory for Process A (20 Unit), Process B (5 Unit), and Process C (10 Unit) sequentially using:
(i) First Fit (ii) Best Fit

4. Schedule these jobs using FCFS (First Come First Serve) and analyze its performance with respect to average waiting time. What is the turnaround time of process B? [4+1=5]

Process	Arrival Time	Duration
A	1	3
B	2	5
C	0	7
D	5	3
E	2	1
F	12	2
G	0	8

5. A virtual memory is addressed using 22 bits and the corresponding physical memory is addressed with 18 bits. The virtual memory stores 256 pages. Find out the following: [2+1+1+1=5]

(i) How many page frames are there in the physical memory?
(ii) What is the size of the physical and virtual memory?
(iii) What is the size of each virtual page?
(iv) How many bits are required to refer to the physical page frames and the virtual pages?

6. (a) Assume, there are currently three pages, A, B and C in the physical memory with initial counter (6-bit) values 010010, 110001 and 011110 respectively. The reference (R) bits for these pages in the last four clock ticks are determined as follows: [4]
Page A: 0, 1, 1, 0
Page B: 1, 0, 1, 0
Page C: 1, 0, 1, 1
Now if a page fault occurs for a new page D, which page will be replaced according to "**Aging**"? Show how the algorithm selects the replaceable page step by step.

(b) What do the Modified bit and the Reference bit of a page refer to? [1]