Exam 1 (Final Exam) – Chapters 8, 18 - 21 & Notes
Total Points: 30

Directions: Answer the following 10 questions in one separate file and submit. Make sure all questions are clearly numbered and answered are in one file to upload. Include your name at the top of the first exam page. The orientation score will be included with the exam.

Short Answer. Show work for problems 1-10. No partial credit. **(20 pts @ 2pts each)**

Note: Only half credit will be given for giving a correct answer without showing work. Wrong answers or no answers will lose the full two points. No partial credit for an attempt with wrong answers. Box in all final answers.

- **Assume any undefined (undeclared) variables have been defined as used.**
- **All provided code segments/images are intended to be syntactically correct, unless otherwise stated (e.g., error is an answer).**

1. What is the run time efficiency (Big O value) of the segment of code shown below?

```
for (int i = 0; i < n; i++)
   for (int j = 1; j < n; j *= 2)
      //Output: i * j
```

2. Find `f(7,7)` using the function definition below.

```
f(x, y) = 2 * y                when x < 3
        = y + f(y - 1, x - 2)  when x > 2
```

3. Given an initially empty stack and the following sequence of operations, what element would be popped next. Read the statements left to right.

```
PUSH(B), PUSH(E), PUSH(N), POP(), PUSH(J), POP(), PUSH(A), PUSH(M),
PUSH(J), POP(), POP()
```

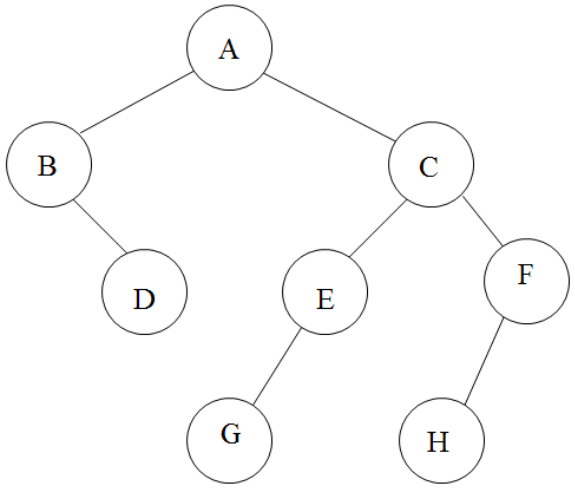
4. Evaluate the prefix expression below:

```
* + + 3 3 3 3
```

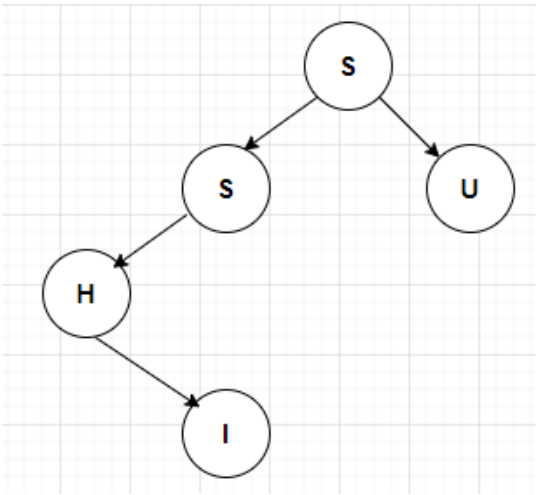
5. Given an initially empty queue and the following sequence of operations, what would be the next DEQUEUED element? Read the statements left to right.

```
ENQUEUE(N), ENQUEUE(A), ENQUEUE(T), DEQUEUE(), DEQUEUE(), ENQUEUE(H),
ENQUEUE(A), DEQUEUE(), ENQUEUE(N), DEQUEUE(), DEQUEUE(), ENQUEUE(H),
ENQUEUE(A), DEQUEUE(), ENQUEUE(L), DEQUEUE(), ENQUEUE(E), DEQUEUE()
```

6. Given the following binary tree, list the non-leaf nodes.



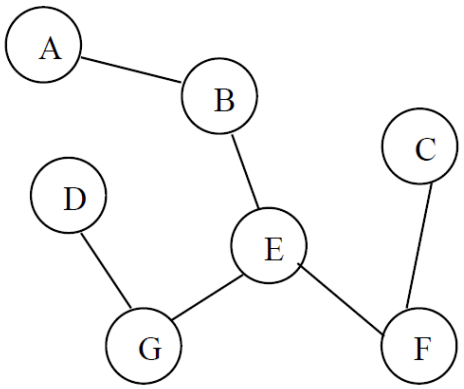
7. Write your first name (minimum of 3 letters) as a binary search tree allowing repeating letters. If your name has duplicate letters insert them into the tree as if they were less than the equal key (to the left). For example: SUSHI



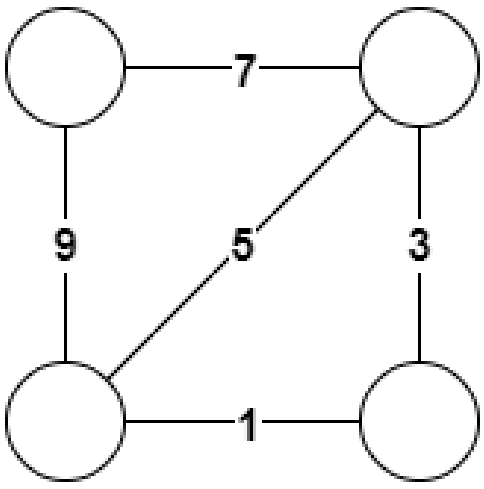
8. Given the following array of 5 elements, trace the selection sort algorithm one iteration at a time. Assume the array is to be sorted in ascending order.

24	7	3	18	5

9. Given the graph below, how many edges and vertices are present (Only a count of each is needed).



10. A minimum spanning tree (MST) is a subset of edges of minimum total weight that connect a graph. In other words, any two vertices in the graph can reach each other by traversing only edges selected to be part of the minimum spanning tree. Below is a weighted, undirected graph. Output the edges that make up the spanning tree and the total weighted sum of the MST.



Orientation- This part has already been taken. Your score will be added to the exam. **(10 pts.)**