Sir Syed University of Engineering & Technology
Faculty of Computing & Applied Sciences
Department of ____Software Engineering_____

Online End Semester Examinations (Spring 2021)

Course Code with Title	**SWE-203T: Data Structure and Algorithm**		**Program**	BS (Software Engineering)
Instructor	**Ms. Dur-e-Shawar Agha** **Mr. Haris Mehboob** **Ms. Saniah Rehan**		**Semester**	3rd
Start date & Time	June 8, 2021 at 08:30 AM	**Submission Deadline**	June 8, 2021 at 1:30PM	
Maximum Marks	50			
Students must meet their submission deadline as there is no re-take or re-attempt after the deadline.				

IMPORTANT INSTRUCTIONS:

Read the following Instructions carefully:

- All Questions carries equal marks
- Attempt All Questions on MS-Word. Font theme and size must be Times New Roman and 12 points respectively. Use line spacing 1.5.
- You may provide answers HANDWRITTEN. The scanned solution must be submitted in PDF file format (Use any suitable Mobile Application for Scanning)
- For Diagrams, you can use paper and share a clear visible snapshot in the same Answer Sheet.
- Arrange questions and their subsequent parts in sequence.
- Make sure that your answers are not plagiarized or copied from any other sources. In case of plagiarism, **ZERO** marks will be awarded.
- Provide relevant, original and conceptual answers, as this exam aims to test your ability to examine, explain, modify or develop concepts discussed during the course.
- Recheck your answer before the submission on **VLE** to correct any content or language related errors.
- You must upload your answers via the VLE platform ONLY.

You must follow general guideline for students before online examination and during online examination which had already shared by email and WhatsApp.

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Q.1. (10)

We have to implement a hash table by initialize a character array of length 15 to store the keys in it. Show the contents of array when the keys are "characters of your full name" inserted into an empty hash table with double hashing to resolve collision in it. Take initial 10 letters of your name. If you have letters less than 10 add X at the end. Use **h (k) = k mod 26** and **h' (k) = k mod 10** as the hash function for the kth letter of the alphabet. (Note: A = 1st letter of alphabet, B= 2nd letter of alphabet ……. Z = 26th letter of the alphabet).

For e.g. name is "DUR E SHAWAR AGHA"

Keys = D U R E S H A W A R (initial 10 letters)

Keys = 4 21 18 5 19 8 1 23 1 18

Q.2. (10)

a. Analyze the following Infix expression and convert into Postfix. Replace operators according to the given sequences.

(A op B) op (C op D op E) op F

Sequence 1: + * ^ - / (if your roll number ends at 0,1,2)

Sequence 2: - / * ^ + (if your roll number ends at 3,4,5)

Sequence 3: * + ^ / - (if your roll number ends at 6,7,8,9)

Note: Suppose, your roll number is 2020-SE-126 so the infix equation is (A * B) + (C ^ D / E)-F then convert this expression into postfix.

b. Analyze and evaluate the above postfix expression [**obtained from Q2(a)**] where **A = 2, B = 3, C = 1, D = [sum of your roll number], E = [Sum of first and last digit of your roll number], F = [sum of second and last digit of your roll number]**

Note: Suppose, your roll number is 2020-SE-126 so sum of your roll number will be: 1+2+6=9 [D = 9], sum of first and last digit of your roll number is 1+2=3 [E = 3] and sum of second and last digit of your roll number is 2 + 6 =8 [F=8].

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Q.3. **(10)**

a. Develop a BST (Binary Search Tree) from your roll number (show all steps). Replace the department value with the position of letter.

b. Analyze the developed tree in part (a) and search node "**last digit of your roll number**" from it. (Show all steps).

c. List the nodes of developed BST by applying *in-order* traversal.

d. Develop a new BST after deleting the node **"second digit of your roll number"** from the above BST.

Note: Suppose, your roll number is 2020-SE-126 so the numbers are 2, 0, 2, 0, 19, 5, 1, 2, 6.
Suppose, your roll number is 2020-SE-005 so the numbers are 2, 0, 2, 0, 19, 5, 0, 0, 5.

Q.4. **(10)**

You have to visit your best friend's house on Sunday. From your house H1 to your friend house H2 there are 2 Gas stations G1 and G2, one flower shop F, one bakery B, two schools S1 and S2, one shopping mall M1, and one Movie Theater T1.

a. You have to draw a graph from starting point H1 to destination H2.

i. **Draw directed and weighted graph with 7 vertices. (If your roll number start with 1)**

ii. **Draw directed and unweighted graph with 8 vertices. (If your roll number start with 2)**

iii. **Draw undirected and weighted graph with 7 vertices. (If your roll number start with 3)**

iv. **Draw undirected and unweighted graph with 8 vertices. (If your roll number start with 4)**

v. **Draw directed and weighted graph with 8 vertices. (If your roll number start with 5)**

vi. **Draw directed and unweighted graph with 7 vertices. (If your roll number start with 6)**

vii. **Draw undirected and weighted graph with 8 vertices. (If your roll number start with 7)**

viii. **Draw undirected and unweighted graph with 7 vertices. (If your roll number start with 9)**

b. Draw Adjacency matrix to store your graph in memory.

c. Traverse your graph from H1 to H2 by Breadth First Search (BFS).

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Q.5. **(10)**

a. In the current scenario of COVID-19 all the restaurants are allowed only for online delivery or takeaway orders. A well-known restaurant "ABC" wants to develop a web based and mobile based application that provides interface between customer and the restaurants. For take away the customer can place the order at cashier counter and waits for its order to be ready. For online delivery customer can place an order either by website or mobile app. After that the order is delivered at home through a rider. The online system offers different deals to the customer and also allow him to make his own deal by adding different items from different categories like he select biryani from rice category and burger from fast food category etc. The online system also has provision to change the menu items by the restaurant like decides to add / delete an item from the menu, put festive offers on some items because of which there is a change in the price of some of the items. Consequently he updates the menu so that those items are deleted temporarily deleted from the display presented to the user.

i. To implement the above scenario suggest two different data structures which are suitable for this scenario. Also explain for which module you used this particular data structure and why?

ii. Suppose the restaurant have to change its menu. Now they wants that under each category the items will be shown in alphabetical order. In class we have learned different sorting techniques according to your perception which technique is suitable and why?

b. Sort the array by taking your name as input (10 characters) in descending order using Selection Sort.

For e.g. name is "Dur e Shawar Agha" so array will be

D	U	R	E	S	H	A	W	A	R