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| Image result for adamas university logo | **ADAMAS UNIVERSITY**  **END SEMESTER EXAMINATION**  (Academic Session: 2020 – 21) | | |
| **Name of the Program:** | MCA | **Semester:** | 1 |
| **Paper Title:** | Data Structure with Python | **Paper Code:** | ECS51147 |
| **Maximum Marks:** | 50 | **Time Duration:** | 3 Hrs |
| **Total No. of Questions:** | 17 | **Total No of Pages:** | 03 |
| *(Any other information for the student may be mentioned here)* | 1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. 2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page. 3. Assumptions made if any, should be stated clearly at the beginning of your answer. | | |

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| **Group A**  **Answer All the Questions (5 x 1 = 5)** | | | |
| 1 | When the size of the stack is 10 and we try to add the 11th element in the stack then the condition is known as\_\_\_ | Remembering | **CO1** |
| 2 | What is the prefix form of infix expression: A+B\*C-D? | Remembering | **CO2** |
| 3 | What would be order for the removal, If the elements '1', '2', '3' and '4' are inserted in a queue? | Remembering | **CO3** |
| 4 | What is the maximum number of children that a node can have in a binary tree? | Remembering | **CO4** |
| 5 | In a circular queue implementation using array of size 5, the array index starts with 0 where front and rear values are 3 and 4 respectively. **Determin**e the array index at which the insertion of the next element will take place. | Evaluating | **CO5** |
| **Group B**  **Answer All the Questions (5 x 2 = 10)** | | | |
| 6 a) | i) What is non-linear data structure Graph?  ii) Create the matrix and adjacency list representation of graph. | Creating | **CO1** |
| **(OR)** | | | |
| 6 b) | i) Explain how graph becomes Tree with a suitable example.  ii) Difference between weighted and un-weighted graph. | Evaluating | **CO1** |
| 7 a) | Develop a python script to insert a node at front and delete from the rear end in a circular linked list. | Creating | **CO2** |
| **(OR)** | | | |
| 7 b) | Explain the doubly linked list with advantages and disadvantages. | Evaluating | **CO2** |
| 8 a) | Discuss with an example about **reheapification** **upward**. | Creating | **CO3** |
| **(OR)** | | | |
| 8 b) | Build a **Min Heap** from the given array:  arr[] = {40, 10, 30, 50, 10,20,60,80} | Applying | **CO3** |
| 9 a) | Create a Structure definition and variable declarations to store the following information for 50 students:  Name, USN, Gender, DOB, and marks in three subjects S1,S2 and S3.  Display the student information with sum and average marks of topper student. | Creating | **CO4** |
| **(OR)** | | | |
| 9 b) | Explain with the help of C coding how **Queue** operations perform using single linked list. | Evaluating | **CO4** |
| 10 a) | Explain with suitable example how memory wastage is occurred in ordinary queue. | Evaluating | **CO5** |
| **(OR)** | | | |
| 10 b) | Discuss with real world example, why stack is called FIFO and Queue is called LIFO. | Creating | **CO5** |
| **Group C**  **Answer All the Questions (7 x 5 = 35)** | | | |
| 11 a) | i) What is the advantage of circular queue over ordinary queue?  ii) Develop an algorithm to stimulate the working of circular queue of integers using linked list. Provide the following operations:   1. Insert 2. Delete 3. Display | Remembering, Creating | **CO1** |
| **(OR)** | | | |
| 11 b) | i) Construct Binary Search Tree : 10 5 12 6 15 7 3 30 25 4 50  ii)Why Binary Search Tree is invented? | Applying, Remembering | **CO1** |
| 12 a) | Write an algorithm to evaluate a postfix expression and apply the same for the given postfix expression. ABC-D\*+E-F+ and assume A=6, B=3, C=2, D=5, E=1 AND F=7. | Remembering | **CO2** |
| **(OR)** | | | |
| 12 b) | How and **selection sort** works? Suppose an array A contains 8 elements as follows: 77 33 44 11 88 22 66 55. Trace insertion sort algorithm for sorting in ascending order. | Remembering | **CO2** |
| 13 a) | Suppose the following circular queue capable of accommodating maximum six elements.  Front=2, Rear=4  Queue: \_, L, M, N, \_, \_,  Describe the queue as the following operations take place   1. Add O 2. Add P 3. Delete two letters 4. Add Q, R, S 5. Delete one letter 6. Add T, U 7. Delete two letter   Show the Front and Rear point at the end of the operations. | Creating | **CO3** |
| **(OR)** | | | |
| 13 b) | Build an undirected graph with five edges and 4 vertices. The vertices should be called v1, v2, v3, v4 and there must be a path of length three from v1 to v4. Draw a line along this path from v1 to v4. | Creating | **CO3** |
| 14 a) | Develop the python script to traverse the Tree using   1. Pre-order Traversal 2. Post-order Traversal 3. In-order Traversal | Creating | **CO4** |
| **(OR)** | | | |
| 14 b) | **Test for** the given data, draw a Binary Search Tree and show the linked list representation of the same:  100, 85, 45, 55, 110, 20, 70, 65 | Analyzing | **CO4** |
| 15 a) | Find the no of bits required for Huffman encoding of above message? Also find the average bits required to represent a character.  Consider the following message:  aa bbbb a bbb ccc ddd eee ccc eee dd eee | Remembering | **CO4** |
| **(OR)** | | | |
| 15 b) | Explain Huffman coding algorithm with a suitable example.  Create Huffman Tree for the following characters along with their frequencies using the Huffman algorithm-   |  |  | | --- | --- | | **Value** | **Frequencies** | | 1 | 5 | | 2 | 7 | | 3 | 10 | | 4 | 15 | | 5 | 20 | | 6 | 45 | | Evaluating | **CO4** |
| 16 a) | Explain the following with diagram and also write algorithm:   1. Insert a node at the beginning, at the end and at the specified position of singly linked list. 2. Deleting the first node, last node and a node from a specified position in case of doubly linked list. | Evaluating | **CO5** |
| **(OR)** | | | |
| 16 b) | Explain Breadth-First Traversal algorithm with a suitable example. | Evaluating | **CO5** |
| 17 a) | Suppose a company keeps a linear array YEAR(1920:1970) such that YEAR[k] contains the number of employees born in year k. Write a module for each of the following tasks:   1. To print each of the years in which no employee was born. 2. To find the number of years in which no employee was born. 3. To find the number of employees who will be at least 50 years old at the end of the year. (Assume 1984 is the current year) | Creating | **CO5** |
| **(OR)** | | | |
| 17 b) | Translate, by inspection and hand , each infix expression to their equivalent postfix expressions:   1. (A+B)\* D+E/(F + G+ D) 2. ((A/B)/C)+D 3. (A-B)/C \* ((C-D/C+D)) | Understanding | **CO5** |

Note: The Sample prepared by assuming 5 COs in a course, considering one CO for one Module.

1. If the COs are higher in numbers that can be managed by equating sub-divisional questions
2. If the COs are lower in numbers, the questions can be increased by equating the number of COs