**Duration: 3hrs** **[Max Marks:80]**

**N.B. : (1) Question No 1 is Compulsory.**

**(2) Attempt any three questions out of the remaining five.**

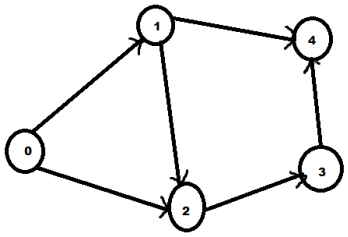
**(3) All questions carry equal marks.**

**(4) Assume suitable data, if required and state it clearly.**

1 Attempt any FOUR **[20]**

a What is a collision in hashing? List the techniques to resolve collisions?

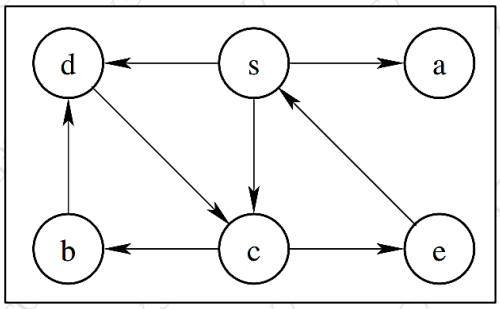
b For the following directed graph, obtain the adjacency matrix. What is the order of matrix.




c Explain time complexity and space complexity.

d Differentiate between Linear and Non-Linear Data Structure.

e Express the following directed graph into Breadth first search traversal sequence.




2 a Consider the following in order and Pre-order traversal of a tree. Is it possible to obtain the Post-order Traversal of the same tree? If yes, construct a binary tree. **[10]**

| In-order | D | B | E | F | A | G | H | C |
|---|---|---|---|---|---|---|---|---|
| Pre-order | A | B | D | E | F | C | G | H |

b Apply the concept of link list to express the following polynomials P1 and P2 into linked list form and add them to form new polynomial P3. Write proper steps with sketches. **[10]**

P1: $5x^4 + 3x^2 + 1$ P2: $4x^4 + 2x^2 + x$

3 a Express the following infix expression into postfix expression using expression conversion rules based on stack. **[10]**

**A B + D E F G H + / + C +**

b For the following expression, obtain the prefix expression using expression conversion rules of stack data structure. **[10]**

$(A + B) * (C - D)$

4 a Explain any five operations performed on Binary Search Tree. **[10]**

b Sort the following array using the Quick Sort algorithm: **[10]**
[9, 7, 5, 11, 12, 2, 14, 3, 10, 6]. Show proper sketch.

5 a A file contains the following characters with the frequencies as shown. If Huffman Coding is used for data compression, determine- **[10]**

1. Huffman Code for each character
2. Average code length
3. Length of Huffman encoded message (in bits)

| Characters | a | e | i | o | u | s | t |
|---|---|---|---|---|---|---|---|
| Frequencies | 10 | 15 | 12 | 3 | 4 | 13 | 1 |

b Write a short note on (any one) : **[10]**

a. Bubble Sort algorithm
b. Binary Sort algorithm
c. Merge Sort algorithm

6 a What is the use of hashing? Show hash table entries for the given dataset using Linear probing: 12, 45, 67, 88, 27, 78, 20, 62, 36, 55. **[10]**

b Write a short note on (Any one) **[10]**

a. Tree Traversal Algorithm
b. Graph Traversal Algorithm

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