Duration: **3 hrs** Total Marks: **80**

N.B: (1) Question No. 1 is Compulsory
(2) Attempt any **three** questions of the remaining **five** questions
(3) **Figures** to the **right** indicate **full** marks
(4) Make suitable assumptions wherever necessary with proper justifications

1. (a) What is a data structure? Explain with examples. **(05)**
   (b)What are the advantages of using dynamic memory allocation over static memory allocation? **(05)**
   (c) Describe Multiway Search Tree with an example. **(05)**
   (d) Write a function in C to implement Shell Sort. **(05)**

2. (a) Discuss file I/O operations in C programming language. **(10)**
   (b)Explain sparse matrix as application of linked list with examples. **(10)**

3. (a) How can we use the QUEUE data structure for simulation? Explain with an example. **(10)**
   (b)Write a function to implement Radix Sort. Sort the following numbers using Radix Sort:
   25, 10, 68, 19, 75, 43, 22, 31, 11, 59. Show output after each pass. **(10)**

4. (a) Write a C program to implement a Circular Linked List which performs the following operations: **(12)**
   (i) Inserting element in the beginning
   (ii) Inserting element in the end
   (iii) Inserting element after an element
   (iv) Deleting a particular element
   (v) Displaying the list
   (b) Apply Huffman Coding for the word "MALAYALAM". Give the Huffman code for each symbol. **(08)**

5. (a) Explain any one application of stack with an example. **(08)**
   (b)Write a program in C to delete a node from a Binary Search Tree. The program should consider all the possible cases. **(12)**

6. (a) Write a program in C to implement the BFS traversal of a graph. Explain the code with an example. **(10)**
   (b) Hash the following in a table of size 11. Use any two collision resolution techniques: **(10)**
   23, 55, 10, 71, 67, 32, 100, 18, 10, 90, 44.

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