Course Code : CST 201/CST 213 **JSRK/MW – 17 / 2017**

Third Semester B. E. (Computer Science and Engineering) Examination

DATA STRUCTURE AND PROGRAM DESIGN

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) Attempt all questions Q. **Three** is compulsory.
(2) All questions carry marks as indicated against them.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data and Illustrate answers with neat sketches wherever necessary.

1. Solve any **Two** :—

(a) Define abstract data type. When will you say that an algorithm is efficient? Give the notations for time complexity and illustrate the answer with suitable example. 5(CO 1)

(b) Write an algorithm to implement conversion of infix to postfix expression further trace the required algorithm clearly indicatting the contents of the stack for the following expression.
A + (B * C) – (D/E ^ F) * G) *H 5(CO 1)

(c) Describe row major and column major ordering of the 2D array and formulate the transformation to solve the following :—
Each element of an array DATA [10][20] requires 4 byte storage space. Base Address of DATA is 2000. Determine the location of DATA [05][05] for row–and column–major ordering. 5(CO 1)

2. Solve any **One** :—

(a) Write a C program using dynamic variable and pointers to construct singly linked list consist of following information : Student ID, student Name, and semester. The list of operations to be supported are :

(i) Insertion at Front.

(ii) Insertion at end.

(iii) Insertion at any position.

(iv) Display all the nodes in the list. 10(CO 1)

(b) Write a C function to create a node in a doubly linked list. Now assume if list is available as circular fashion then develop a C function to append element at front and end in this doubly circular linked list. 10(CO 1)

(c) Write a C function to add two polynomials. The polynomials are represented as singly linear linked list. Write main() to demonstrate the polynomial addition. Show trace of execution. 10(CO 1)

3. (a) Construct a binary tree given the following traversal :

Preorder : ABDGHCEIF

In–order : GDHBAEICF 3(CO 2)

(b) Illustrate Threaded Binary tree. Explain the impact of such a representation on tree traversal procedure with an example. 5(CO 2)

(c) Write a recursive C function to search a node in a BST. 2(CO 2)

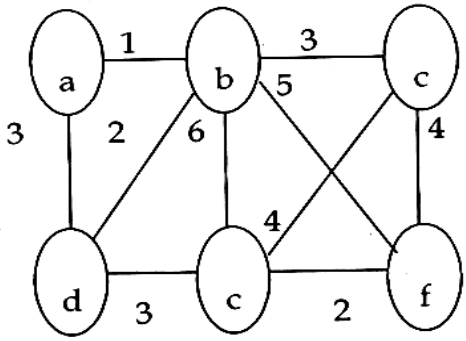
4. Solve any **One** :—

(a) Construct a hash table using closed hash method for the following. Assume hash table of size 7, use division method for the given key set [15 11 25 16 9 8 12] and find if any collision occurs. If yes then how will you resolve the collision ? Illustrate your answer in brief. 10(CO 3)

(b) Differentiate closed hashing and open hashing. Demonstrate insertion of keys 5, 28, 29, 15, 20, 33, 12, 17, 10 into a hash table with separate chaining based collision resolution strategy. Let the table have 9 slots and apply the division hash function. 10(CO 3)

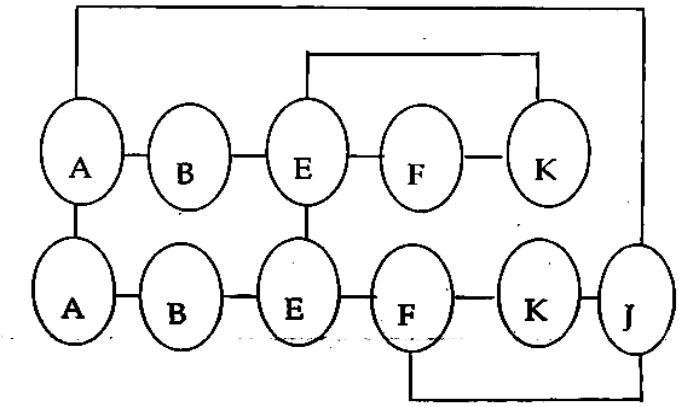
5. Solve any **One** :—

(a) Write an algorithm for implementing Prim's method. Write an algorithm to find cost of Tree. demonstrate above algorithms to compute the minimum cost of MST of following graph :—



10(CO 2,CO 4)

(b) Describe DFS algorithm and Find out the DFS traversal of the following graph starting at node A :—



10(CO 2,CO 4)

6. Solve any **Two** :

(a) Describe an algorithm to implement shell sort for the following sequence of list to be arranged in ascending order :—
[11, 55, 10, 88, 32, 16, 64, 33, 21] 5(CO 4)

(b) Discuss the heap sort method of sorting a list. Define its time complexity. Show its operation on the list containing elements :
[42, 32, 48, 20, 58, 53, 75, 53, 97] 5(CO 4)

(c) How does bucket sort outperforms the comparative sorts ? Apply radix (bucket) sort technique to order the list A, in ascending order. The list is A = {329, 869, 423, 677, 121} 5(CO 4)