RRD/2KEN/ET – 8167

B. E. Fourth Semester (Computer Technology) Examination

Course Code : CT 1223 **Course Name : Advanced Data Structures**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Illustrate your answers wherever necessary with the help of neat sketches.
(6) Use C code wherever necessary.

1. Solve any **Two** :—

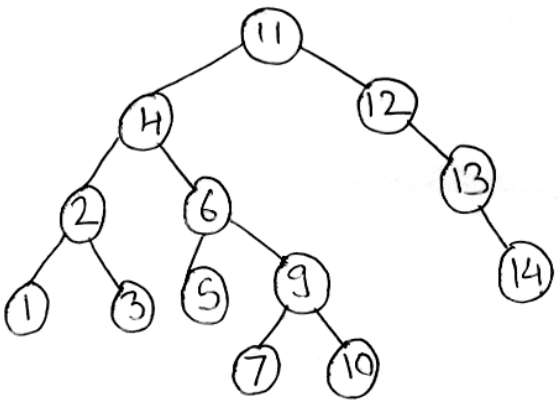
   (a) Construct a red-black tree by inserting the keys in the following sequence into an empty red-black tree : 13, 10, 8, 3, 4, 9. Show each step.

   (b) Write an algorithm for Heap sort. Also explain its time complexity.

   (c) What is difference between Binary Tree and Binary search Tree ? Give an example of tree that is Binary Tree but not Binary search Tree. 7

2. Solve any **Two** :

   (a) Consider the following splay tree :



   Perform a delete for the key 3 under the assumption that this is a bottom-up splay tree

(b) Define Tries. Write an algorithm to insert an element into trie.

(c) Construct 3-dimensional tree from (20, 12, 30), (15, 18, 27), (19, 19, 37), (40, 12, 39), (17, 16, 22), (22, 10, 33), (25, 24, 10), (16, 15, 20), (12, 14, 20), (24, 9, 30), (18, 16, 18), (50, 11, 40) 8

3. Solve any **Two** :

(a) Construct B^+ tree for 1, 4, 7, 10, 17, 21, 31, 25, 19, 20, 28, 42 with order 4.

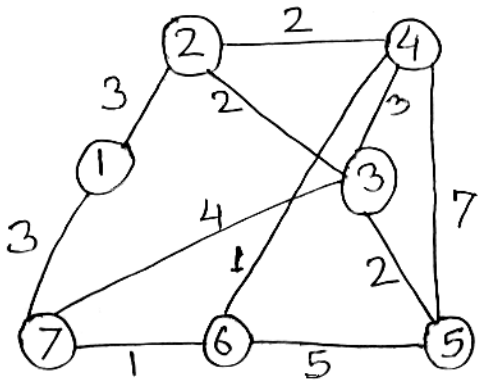
(b) What is B tree ? Give its properties.

(c) Apply merge sort as an external sort for sorting following sequence of elements considering size of main memory as 20 bytes and each element is requiring 2 bytes 21, 8, 16, 32, 14, 6, 48, 55, 41, 3, 9, 7, 1, 20, 13, 64, 11, 13, 4, 2.

How many swap ins and swap outs are required ? 7

4. Solve any **Two** :

(a) Generate the minimum cost spanning Tree using PRIM's algorithm.

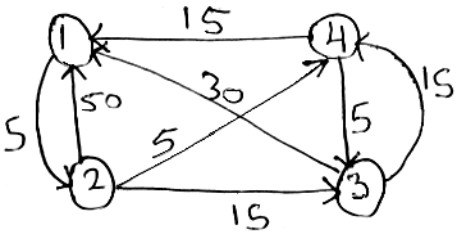


(b) Justify the statement that "Every Tree is a Graph but Every graph is not a Tree".

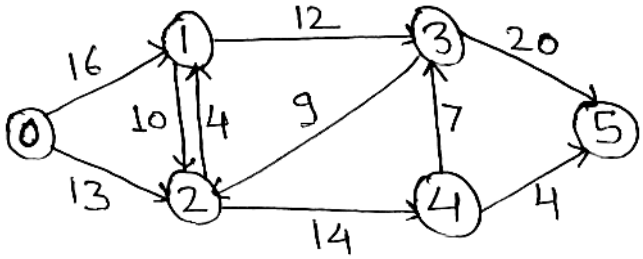
(c) How you determine if a given graph is Bipartite Graph using DFS ? 8

5. Solve any **Three** :

(a) How all pairs shortest path algorithm works for the following graph ?

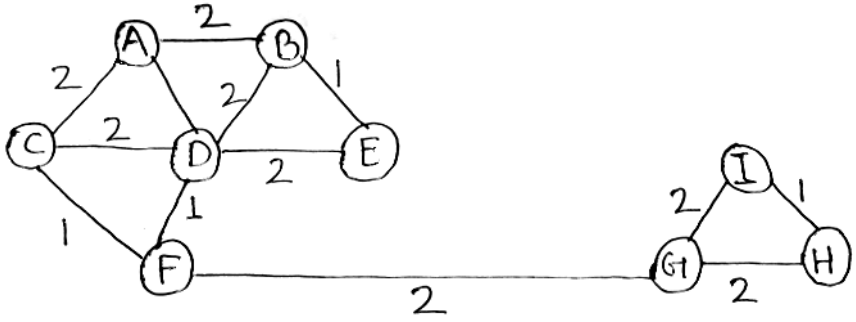


(b) Perform the ford-Fulkersm algorithm on following graph.



(c) Explain Topological sorting with example. Also give its applications.

(d) Find the number of distinct minimum spanning tree for following graph.



15

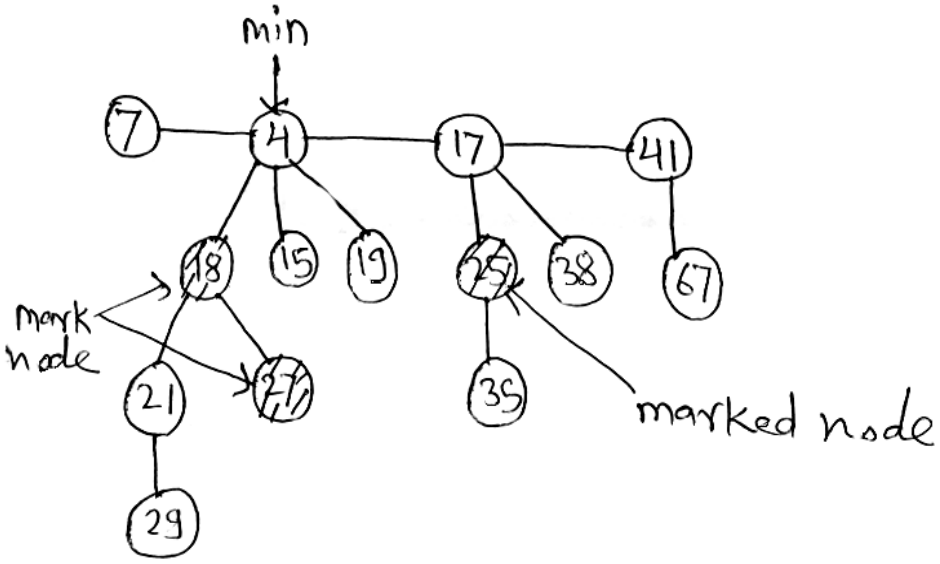
6. Solve any **Three** :

(a) What is garbage collection ? How is it done in C ?

(b) What is the used of dynamic memory allocation ? Explain each function with suitable example.

(c) You have a set of elements S = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}. There are 10 elements (N = 10). Use an array arr to manage the connectivity of the element. Arr [ ] that is indexed by elements of sets, which are of size N can be used to manage the operation of Union and Find.

(d) Delete the min node from given Fibonacci Heap.



15