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Question Paper Code : 71404

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Third Semester

Petrochemical Technology

CS 3206 — DATA STRUCUTRES

(Common to CS 1201 Data Structures for Electrical and Electronics Engineering, Electronics and Communication Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Information Technology and Computer Science and Engineering)

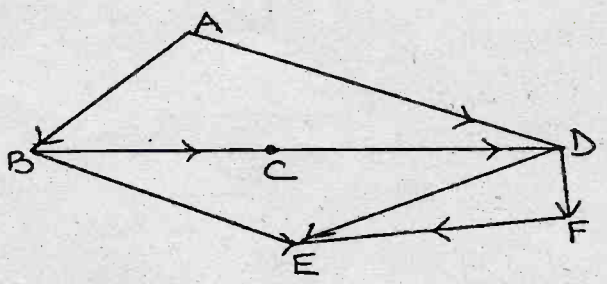
(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Which of the following function grows faster: $N \log N$ or $N^{1+\varepsilon/\sqrt{\log N}}$?
2. Distinguish between stack and queue.
3. What arc the advantages of list implementation over array implementation?
4. What is amortized time bound?
5. Inorder traversal of a binary tree produces DBEFCA. What is its correct preorder traversal?
6. Define hashing.
7. Write the depth first search for the following graph. (Start with A)



8. Prove that in a simple, undirected graph with 'n' vertices and 'e' edges,

$$\sum_{i=1}^{n} \text{degree}(v_i) = 2e$$

9. What are the general lists in C?

10. Enumerate the disadvantages of reference count method.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Consider the following program segment: (4)

```
unsigned int functionl(unsigned int n)
{ int num = -l,  result = l;
  for(unsigned int i = 0; i ≤ n; ++i)
{ int cost sum = result + num l;
      num l = result;
      result = sum;
      }
      return result;
}
```

Determine the running time and value returned by function l.

(ii) An algorithm takes 0.5 ms for input size 100. How long will it take for input size 500. If the running time is the following? (12)

(1) Linear

(2) Quadratic

(3) Cubic

(4) O(N log N)

Or

(b) (i) Write an O(l) algorithm to determine n! for $1 \le n \le 15$. (8)

(ii) Write notes on : (8)

(1) Time complexity

(2) Space complexity

12. (a) (i) What data structure is suitable for evaluating an arithmetic expression? Develop programs for evaluating the expression : $A-(((B-C)*(D/E)+F)/G)$. (8)

(ii) Develop a program which changes the INFO field of k^{th} node of a singly list to the value given by the user. (8)

Or

(b) (i) Write programs for following requirements:

(1) Delete the first node of a circular double linked list. (5)

(2) Assume a doubly linked list with elements 1, 2,5,7 (in order). Now insert node with value 4 (in order). (5)

(ii) In simple queues (implemented using array) elements are shifted towards front with every deletion. Write a program to implement this type of queue. (6)

13. (a) (i) Consider an initially empty binary search tree. Show illustrations for the following operations (in order). (6)

(1) Add 75, 55, 40, 45, 30, 20, 96, 47, 65, 46

(2) Delete 20

(3) Delete 40

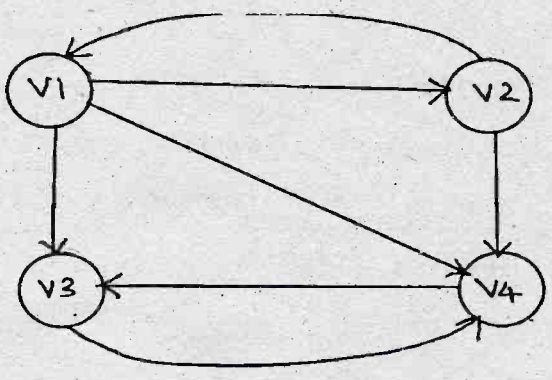
(4) Delete 47

(ii) Construct a Huffman tree for the weights {3, 7, 9, 12, 15, 20, 25}. Write the algorithm and analyze the time complexity. (10)

Or

(b) Write programs for in-order, pre-order and post-order traversal of a binary tree without recursion.

14. (a) Consider a graph G as shown below:



(i) Write the Warshall's algorithm. (4)

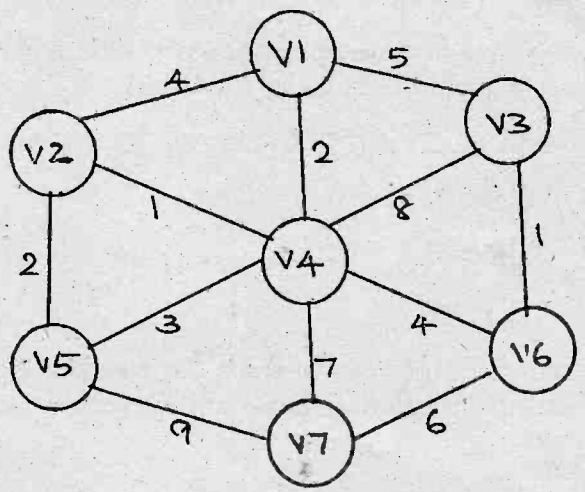
(ii) Find the path matrix of G using Warshall's algorithm. (4)

(iii) From the path matrix, obtain all elementary paths from any vertex to other. (4)

(iv) Can you conclude about any cycle in the graph from the path matrix P as obtained by you. (4)

Or

(b) (i) What is a minimum spanning tree? Write Kruskal's algorithm and trace down its steps to obtain a minimum spanning tree for the following graph: (10)



(ii) Write an algorithm to calculate the number of edges in a directed graph using linked representation. (6)

15. (a) Implement the routines addon, sethead, settail and crlist in C for lists.

Or

(b) Write short notes on:

(i) Garbage collection (8)

(ii) Collection and compaction. (8)
