

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2018 - 19 Examination

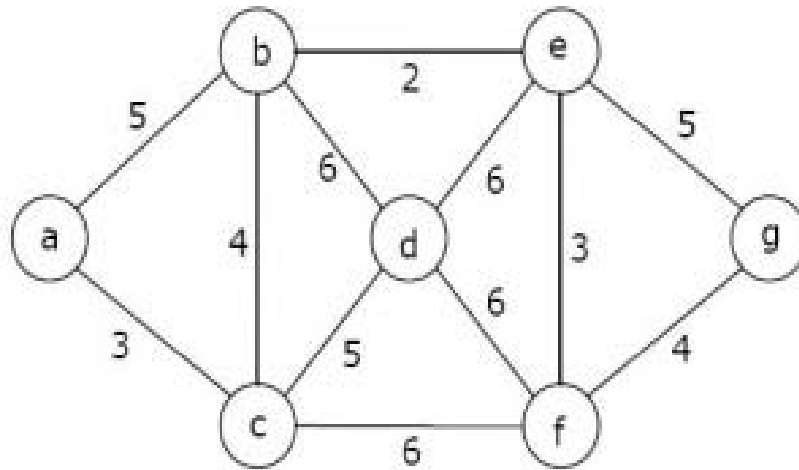
Semester: 5**Subject Code: 03105302****Subject Name: Design and Analysis of Algorithm****Date: 17/05/2019****Time: 10.30 am to 1.00 pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)

1. Let X be a problem that belongs to the class NP. Then which one of the following is TRUE?
 - a) There is no polynomial time algorithm for X.
 - b) If X can be solved deterministically in polynomial time, then $P = NP$.
 - c) X may be undecidable.
 - d) If X is NP-hard, then it is NP-complete.
2. Given two vertices in a graph s and t, which of the two traversals can be used to find if there is path from s to t?
 - a) Only DFS
 - b) Only BFS
 - c) Both BFS and DFS
 - d) Neither BFS nor DFS
3. To determine the efficiency of an algorithm the time factor is measured by:
 - a) Counting number of statements
 - b) Counting kilobytes of algorithm
 - c) Counting number of key operations
 - d) Counting micro seconds
4. Let $f(n)$ and $g(n)$ be asymptotically non-negative functions. Which of the following is correct?
 - a) $\theta(f(n) * g(n)) = \min(f(n), g(n))$
 - b) $\theta(f(n) * g(n)) = \max(f(n), g(n))$
 - c) $\theta(f(n) + g(n)) = \max(f(n), g(n))$
 - d) $\theta(f(n) + g(n)) = \min(f(n), g(n))$
5. What is the worst case complexity of quick sort ?
 - a) n
 - b) $n \log n$
 - c) n^2
 - d) 2^n
6. Consider the following two sequences :
 $X = \langle B, C, D, C, A, B, C \rangle$, and $Y = \langle C, A, D, B, C, B \rangle$
 The length of longest common subsequence of X and Y is _____.
7. The recurrence relation for time complexity of the Tower of Hanoi problem with n discs is _____.
8. _____ is the worst case complexity of sorting n numbers using randomized quicksort.
9. _____ is recurrence for worst case of Binary Search Algorithm.
10. Time complexity of following function is _____.

```
void function(int n)
{
  for(int i=1;i<n;i=i*2)
  {
    printf("Design");
  }
}
```
11. List out various properties of an algorithm.
12. Define Directed Acyclic Graph.
13. What is Optimal Substructure property?
14. Is $2^{n+1} = O(2^n)$? Explain.
15. Arrange following rate of growth in increasing order.
 $n \log n$, n^2 , 1, n, $\log n$, $n!$, n^3 .

Q.2 Answer the following questions. (Attempt any three)**(15)****A)** Find out Minimum Spanning Tree from following Graph:**B)** Given a sorted array and a number x, write an algorithm that counts the occurrences of x in the array.**C)** A networking company uses Huffman Coding technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:

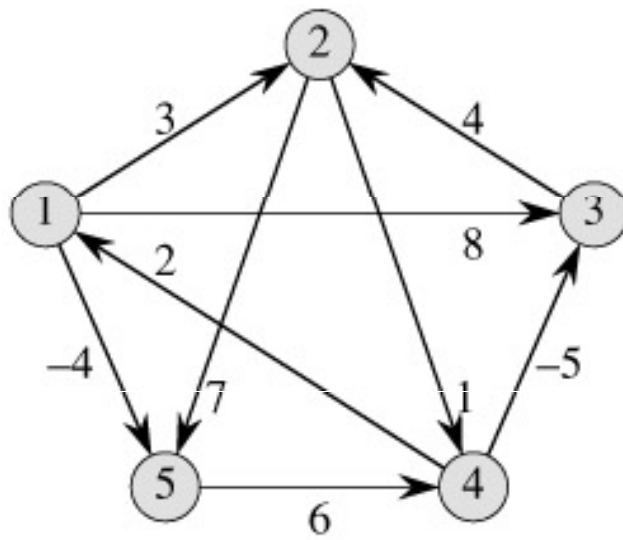
Character	Frequency
a	5
b	9
c	12
d	13
e	16
f	45

How many bits required to encode the message?

D) Consider the weights and values of items listed below. Note that there is only one unit of each item is available. Moreover, no item may be split. The task is to pick a subset of these items using greedy method, such that their total weight is no more than 11 Kgs and their total value is maximized.

Item number	Weight (in Kgs)	Value (in Rupees)
1	10	60
2	7	28
3	4	20
4	2	24

Q.3 A) Find out shortest path between all pair of vertices by applying Floyd-Warshall Algorithm.**(07)**



B) Solve following recurrence relation:

(08)

i) $T(n) = 4T(n/2) + \log n$

ii) $T(n) = 2T(n-1) - 1$ if $n > 0$, otherwise 1

OR

B) Explain Rabin-Karp algorithm for string matching with example.

(08)

Q.4 A) What is N Queen's Problem? Solve 4 Queen's Problem using Backtracking Method.

(07)

OR

A) Let M_1 , M_2 , M_3 and M_4 be four matrices of dimensions 10×5 , 5×20 , 20×10 , and 10×5 , respectively. What is the minimum number of scalar multiplications needed to find the product $M_1M_2M_3M_4$ using the basic matrix multiplication method?

(07)

B) Differentiate following terms:

(08)

i) Dynamic Programming approach and Greedy Method

ii) Iterative and Recursive Algorithm