Regn. No. | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY
(Constituent Institute of Manipal University)
MANIPAL-576104

V SEMESTER B.TECH (COMPUTER SCIENCE AND ENGINEERING)
DEGREE END-SEMESTER EXAMINATIONS, NOV/DEC 2015
SUBJECT : DESIGN AND ANALYSIS OF ALGORITHMS(CSE 303)
DATE: 27-11-2015

REVISED CREDIT SYSTEM

TIME:03 HOURS MAX.MARKS : 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.

1A. Design a $\theta(n)$ efficiency algorithm for computing the value of a polynomial 3M
$p(x) = a_n x^n + a_{n-1}x^{n-1} + \ldots a_1 x + a_0$
at a given point x_0.

1B. For each of the following functions $g(n)$, indicate the class $\Theta(g(n))$ the function belongs to. Prove your assertions using limits. 4M

i. $2^{n+1} + 3^{n-1}$

ii. $2n \log(n+2)^2 + (n+2)^2 \log \frac{n}{2}$

1C. Solve the following recurrence relations using backward substitution. 3M

i. $x(n) = 3x(n-1)$ for $n > 1, x(1) = 3$

ii. $x(n) = x(n/3) + 1$ for $n > 1$, $x(1) = 1$

2A. Write the recursive calls made by top-down algorithm for Fibonacci series, for n=7. Derive an equation for the time complexity of the algorithm. 3M

2B. A network topology specifies how computers, printers and other devices are connected over a network. The figure Q2.B illustrates two common topologies of networks: the ring, the star. 4M

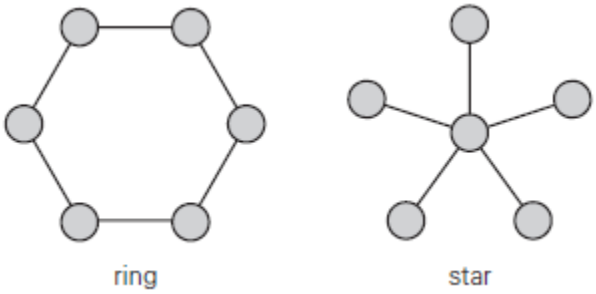

Fig : Q2.B

You are given a boolean matrix $A[0 \ldots n-1, 0 \ldots n-1]$, where n > 3. Determine which of these two topologies the matrix represents. Design a brute-force algorithm for this task and indicate its efficiency class.

2C. Show clearly the steps involved in sorting the following items by Quicksort, which considers the last element as the pivot. 3M
8,9,3,1,4,2,7,6,5

3A. Write a non-recursive iterative Breadth-First Search(BFS) Algorithm. 3M

3B. Determine the Topological Sort for the graph Fig. Q3.B. 4M

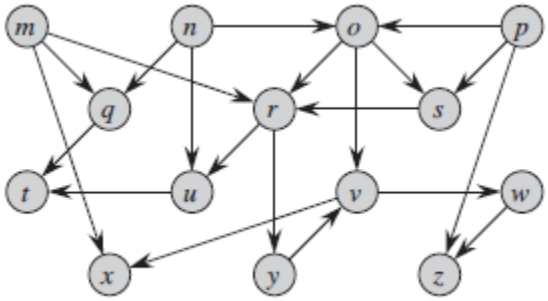

Fig : Q3.B

3C. Solve the recurrence for the number of additions required by Strassen's algorithm. Assume that n is a power of 2. 3M

4A. Write all the permutations generated by Johnson Trotter algorithm for the following items. 4M
A,B,C,D

4B. Construct a 2-3 tree for the following list. 3M
10, 6, 9, 4, 3, 5, 8, 1, 2

4C. Explain any two problems solvable by problem reduction method. 3M

5A. Write tables used in Boyer-Moore string matching algorithm for the following text. 4M

Pattern - TCCTATTCTT

Text - TTATAGATCTCGTATTCTTTTATAGATCTCCTATTCTT

Determine number of comparisons in matching pattern against text using Boyer-Moore algorithm.

5B. Solve the Knapsack problem shown in Table 5.C using Dynamic Programming. Show clearly the table. 3M

Item	1	2	3	4
Weight	4	7	5	3
Value	40	42	25	12

Tab : 5.C

The capacity of the knapsack is W = 10.

5C. Using Kruskal's algorithm, obtain a minimum cost spanning tree for graph shown in Figure Q5.C. 3M

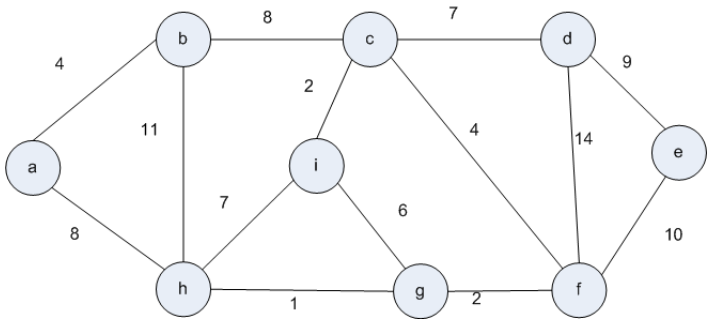

Fig : Q5.C

6A. Using Floyd's algorithm, solve the all-pairs shortest path problem for the graph whose weight matrix is given below. 3M

$$\begin{bmatrix} 0 & 2 & \infty & 1 & 8 \\ 6 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix}$$

6B. Construct a Huffman code for the symbols in the Table 6.B : 3M

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

Tab : 6.B

Decode the text whose encoding is 100010111001010 using the above Huffman code.

6C. Explain the following with an example for each. 4M

i. tractable algorithms

ii. intractable algorithms

iii. decidable problems

iv. undecidable problems