Total No. of Questions : 7]

SEAT No. :

PA-3400

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M.Sc.

COMPUTER SCIENCE

CSUT-112 : Design and Analysis of Algorithms

(2019 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***

Q1) Solve any five of the following. **[5×2=10]**

a) Define θ notation and show that $5n^2+3n$ is $\theta(n^2)$.

b) List any four algorithms that use divide and conquer strategy.

c) Define minimum spanning tree.

d) What do you mean by longest common subsequence problem?

e) Define :-

i) Tree edge

ii) Back edge

f) Give implicit and explicit constraints of 8 Queen's problem.

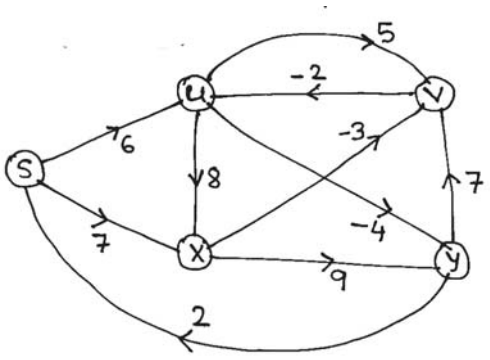
g) Write two bounding function associated with every node in LCBB.

Q2) Solve the following.

a) Rank the following functions in their increasing order of growth rate. **[7]**

e^n, n^n, $n!$, $\log_e(n^n)$, n^2

b) Find out the shortest paths from source 's' to all other vertices. **[5]**



P.T.O.

Q3) Solve the following.

a) Explain quick sort algorithm. Sort the following numbers using quick sort. **[7]**

26, 5, 37, 1, 61, 11, 59, 15, 48, 19.

b) Find an optimal solution to the knapsack instance **[5]**

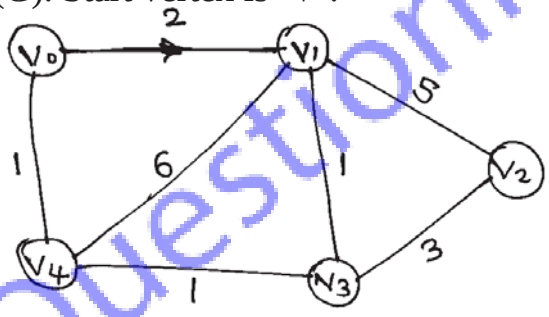
n = 3 m = 20 $(p_1, p_2, p_3) = (25, 24, 15)$

$(w_1, w_2, w_3) = (18, 15, 10)$

Using function method, from dynamic programming.

Q4) Solve the following.

a) Using prim's algorithm find the minimum spanning tree of the following graph (G). Start vertex is 'V'. **[7]**



b) Find longest common sub - sequance of X and Y. Where **[5]**

X = <A, B, C, B, D, A, B>

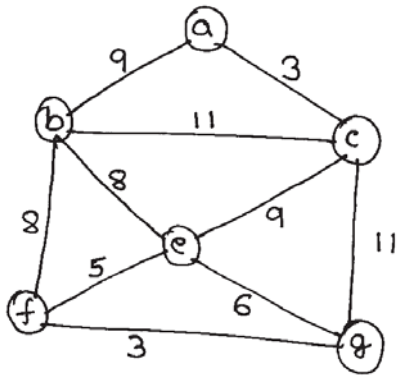
Y = <B, D, C, A, B, A>

Q5) Solve the following.

a) Solve traveling sales person problem (TSP) using dynamic programming method for the graph G given by adjacency matrix. **[7]**

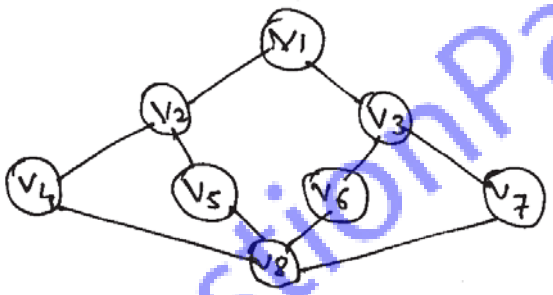
$$A = \begin{bmatrix} 0 & 15 & 9 & 5 \\ 19 & 0 & 7 & 10 \\ \infty & 10 & 0 & 10 \\ 6 & \infty & 6 & 0 \end{bmatrix}$$

b) Find the minimum spanning tree for the following graph using Kruskal's algorithm. **[5]**



Q6) Solve the following.

a) Draw BFS and DFS for following graph. **[7]**



b) Sort the following numbers with counting sort algorithm. **[5]**

5, 3, 1, 2, 1, 4, 1, 3, 2, 5.

Q7) Write a short note on any two of the following. **[2×6=12]**

a) Define the term with example.

i) Optimization problem

ii) NP Hard

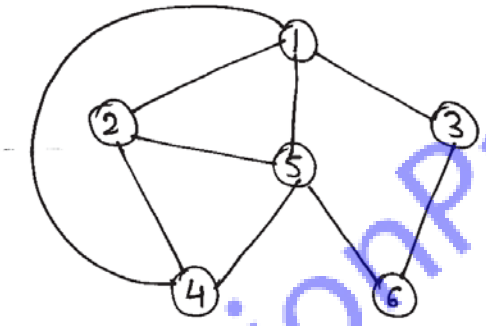
iii) Matrix chain multiplication

b) Draw the portion of state space tree generated by LCBB for the following instance $n = 5$ $m = 12$.

$w = (4, 6, 3, 4, 2)$

$p = (10, 15, 6, 8, 4)$

c) What is Hamiltonian cycle? Find out all possible Hamiltonian cycle for the following graph.



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