

Total No. of Questions : 7]

SEAT No. :

P3864

[Total No. of Pages : 4

[5640]- 5002

M.Sc. (Computer Science) (Semester - I)

CSUT - 112 : DESIGN AND ANALYSIS OF ALGORITHMS
(2019 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :-

- 1) Question 1 is compulsory.
- 2) Solve any five questions from Q. 2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

Q1) Solve any five of the following :

[10]

- a) List asymptotic notations.
- b) What is divide and control strategy?
- c) Define dynamic programming.
- d) Which data structures are used for implementing DFS & BFS?
- e) Give difference between fixed tuple and variable tuple formulation.
- f) What do you mean by branch and bound.

Q2) Attempt all questions

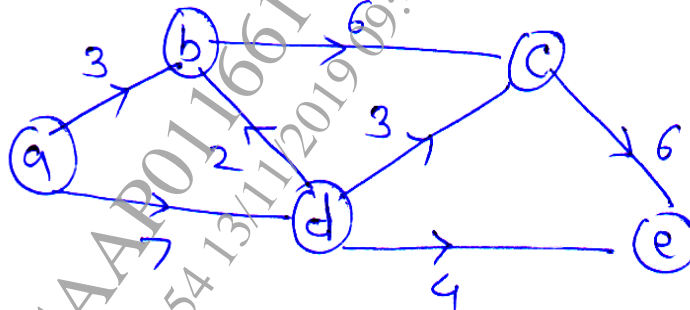
[12]

- a) Order the following functions in ascending order of their growth rates. [5]
 $n^2, \log n, n^3, 2^n, n \log n, n!$
- b) Show how mergesort algorithm works on the following numbers [5]
20, 40, 50, 15, 30, 35, 10, 5
- c) Define dominance rule. [2]

P.T.O.

Q3) Attempt all questions. [12]

- a) Define Ω notation. Prove that $10n^2 + 3n + 2 = \Omega(n^2)$ [5]
 b) Find the shortest path from source 'a' to all other vertices in following graph using greed method. [5]



- c) What is bounding function? [2]

Q4) Attempt all questions. [12]

- a) Explain algorithm to construct Huffman code. construct huffman code for following character set using variable size coding. [5]

Sr.No.	1	2	3	4	5	6	7
Character	a	e	i	s	t	in	Blank Space
Frequency	10	15	12	3	4	10	13

- b) Consider the knapsack instance $n = 4$ $w = (2,4,6,9)$, $P = (10, 10, 12, 18)$ & $m = 15$. Find the optimum solution of the 0/1 knapsack using merge & purge method. [5]
 c) What do you mean by in-place sorting algorithm? Give example of in-place sorting algorithm. [2]

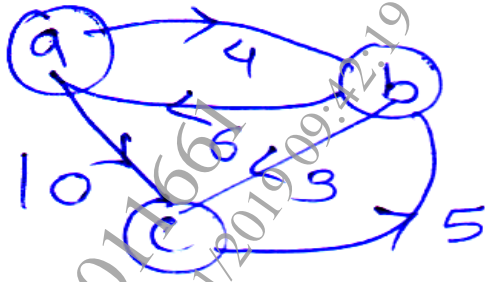
Q5) Attempt all questions. [12]

- a) Kartik is seventh standard student, Teacher gave assignment, project, music test, sports activity to the class.

	Assignments	Music test	Project	Sports Activity
Burden	8	5	10	5
Marks	10	7	20	8

Maximum burden he can take is 23 units Help kartik to get maximum marks with the burden he can sustain. [5]

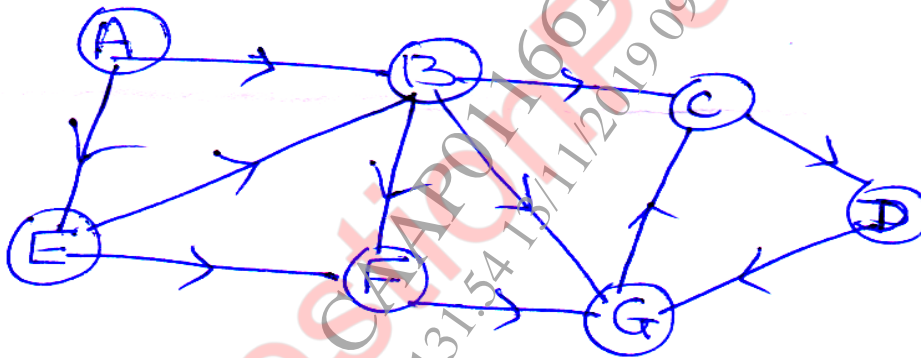
- b) Using Floyd Warshall's algorithm. Find shortest path between every pair of vertices of the given graph. [5]



- c) Define an articulation point. [2]

Q6) Attempt all questions. [12]

- a) Explain BFS. What is its time complexity. Illustrate it on the following graph. [5]



- b) Obtain the reduced cost matrix for the travelling salesperson instance given by the cost matrix. [5]

$$\begin{bmatrix} \infty & 7 & 3 & 4 \\ 4 & \infty & 4 & 8 \\ 10 & 5 & \infty & 5 \\ 9 & 5 & 5 & \infty \end{bmatrix}$$

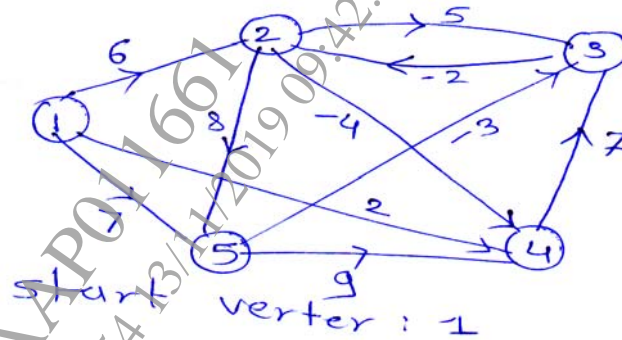
Which node will be selected next in LCBB formulation of problem.

- c) State any two differences between traditional matrix multiplication and Strassen's matrix multiplication. [2]

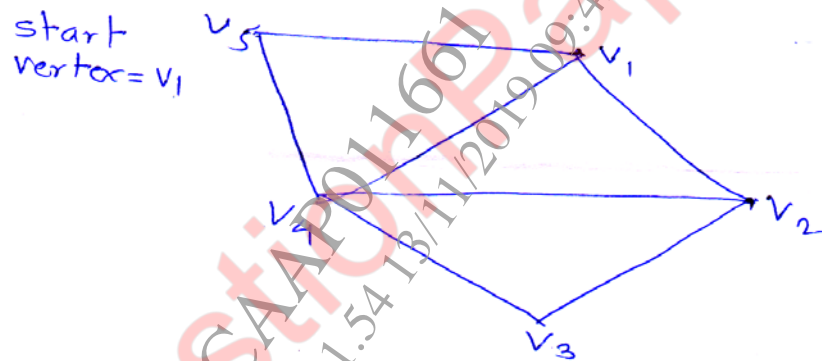
Q7) Attempt any two of the following.

[12]

- a) Explain single source all destination shortest path problem using dynamic programming. Solve the following. [6]



- b) What is Backtracking? Explain Hamiltonian cycles from the following graph [6]



- c) Define P & NP Classes. Explain relationship between P, NP, NP complete and NP-Hard Problems. [6]

