# BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)
## B.Tech.Sem - IV CS&E :SUMMER- 2022
## SUBJECT : DESIGN OF ALGORITHMS

Day : Wednesday
Date : 22-06-2022

**S-24306-2022**

Time : 10:00 AM-01:00 PM
Max. Marks : 60

**N.B.:**

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data, if necessary.
4) Draw neat labeled diagrams **WHEREVER** necessary.

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**Q.1** Show that order of growth of functions N, $N^{1.5}$, $N^2$, N logN, N log log N, N $\log^2$ N, N log $N^2$, $2^N$, $2^{N/2}$, 50, $N^2$ log N and $N^3$. Justify if any function has same rate of growth. **(10)**

**OR**

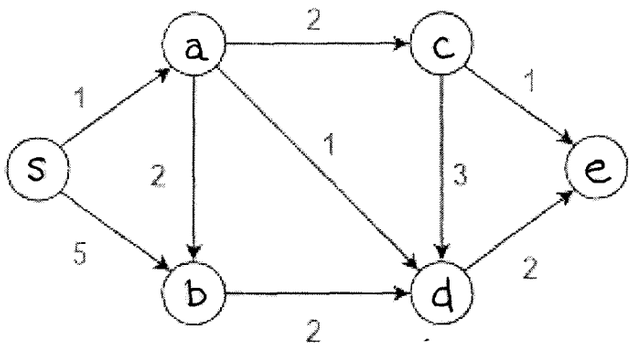
**Q.1** Explain in detail the loop invariants with respect to insertion sort. **(10)**

**Q.2** Write algorithm of Quick Sort. Analyze what is its best and worst case complexities. Apply on 45, 20, 70, 38, 11, 31, 85, and 57. **(10)**

**OR**

**Q.2** Explain how Strassen's Matrix Multiplication is better than Naive and Divide and Conquer both matrix multiplications. **(10)**

**Q.3** Write algorithm for Single Source Shortest Path that uses Greedy Method. Also analyze time complexity and apply on the given graph. **(10)**




**OR**

**Q.3** Solve Knapsack problem where profit P = (10, 5, 15, 7, 6, 18, 3) and weights W = (2, 3, 5, 7, 1, 4, 1) where capacity of the bag is 15 and total item n = 7. Solve and compare using both DP and Greedy Method. **(10)**

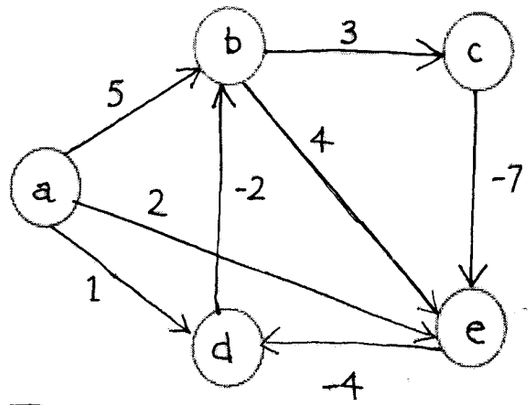
**Q.4** Write a note on: **(10)**

i) OBST
ii) Difference between DP and Greedy Method

**OR**

**P.T.O.**

**Q.4** Write algorithm for All Pair Shortest Path using DP. Also explain time complexity and apply on the given graph. **(10)**




**Q.5** What is Backtracking? Demonstrate on 8 Queens problem. **(10)**

**OR**

**Q.5** Write a note on: **(10)**

i) LC Branch and Bound

ii) FIFO Branch and Bound

**Q.6** What are NP- Hard and NP- Complete problems? Explain with definitions and examples. **(10)**

**OR**

**Q.6** What are approximation algorithms? Explain any two in detail. **(10)**

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