B.E. Fifth Semester (Computer Technology) (C.B.S.)

Design & Analysis of Algorithms

P. Pages : 3 **NKT/KS/17/7347**

Time : Three Hours * 0 0 5 7 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain Geometric and Harmonic series with one example of each. **7**

b) Solve the following recurrence. **6**

$T(n) = 3$ if $n = 0$

$= 2t_{n-1} + 2^n + 5$ otherwise

OR

2. a) Prove that arithmetic series. **3**

$$\sum_{k=1}^{n+1} k = \frac{1}{2} n (n+1)$$

b) $T(n) = 7T(n/2) + n$ solve this recurrence by using recursion tree method. **4**

c) Explain principles of designing an algorithm in brief. **6**

3. a) What are the different Asymptotic notations? Explain them briefly for the following equations, find the values of constants using various approaches. **8**

i) $3n + 2$

ii) $10n^2 + 4n + 2$

b) Explain quick sort with example. **6**

OR

4. a) Write any two methods of amortized analysis in brief. **6**

b) Use Strassen's algorithm to compute the matrix product. Show the process **8**

$$A = \begin{bmatrix} 1 & 3 \\ 5 & 7 \end{bmatrix} \quad B = \begin{bmatrix} 8 & 4 \\ 6 & 2 \end{bmatrix}$$

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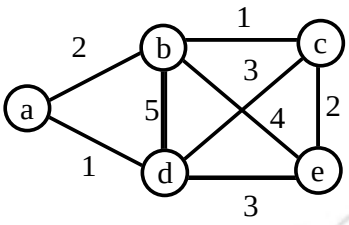
5. a) Explain job scheduling approaches. Find the best possible sequence for the following deadlines. **7**

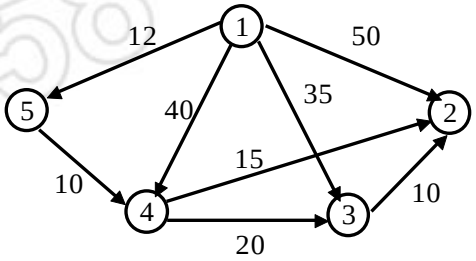
Jobs	Gain	Deadtime
1	35	3
2	20	1
3	18	3
4	16	4
5	12	2
6	10	2
7	8	1

b) Write a KRUSKAL algorithm to generate spanning tree. Also implement algorithm on following graph. **7**



OR

6. a) Write Greedy based single source shortest path algorithm. Implement the algorithm on following graph. **7**



b) Explain Knapsack problem with one simple example. **7**

7. a) Implement LCS for the following sequence **6**
x = a, a, b, a, a, b, a, b, a, a
y = b, a, b, a, a, b, a, b

b) What is Travelling salesman problem? Implement it for the following matrix. **7**

$$\begin{bmatrix} 0 & 8 & 16 & 15 \\ 14 & 0 & 9 & 12 \\ 7 & 10 & 0 & 6 \\ 11 & 13 & 10 & 0 \end{bmatrix}$$

OR

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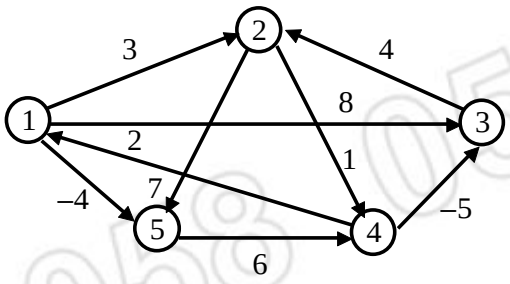
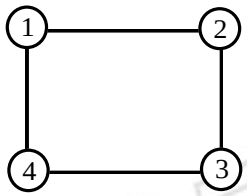
8. Write Floyd Warshall algorithm for all pairs shortest path problem? Calculate distance matrix and path matrix for following graph. **13**



9. a) Write a algorithm for vertex cover problem using approximation approach. **6**

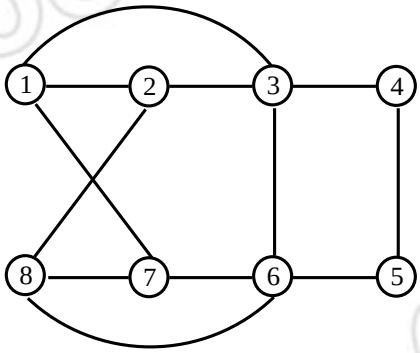
b) What is planner graph? Implement graph coloring on following graph and generate solution space tree of no. of permitted colors = 3. Also write algorithm for the graph coloring. **7**



OR

10. a) What is backtracking? Explain the application in which backtracking principle can be used to design a solution. **6**

b) What is the use of Hamiltonian cycle? Implement Hamiltonian cycle on following graph. **7**



11. a) Write a note on:

i) Clique **3**

ii) NP-Hard **3**

iii) NP-Complete **3**

b) Explain polynomial Reduction. **4**

OR

12. a) What is non-deterministic algorithm? Explain primality testing. **7**

b) Write a brief note on NP-Complete problem. **6**

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