Course Code	**:**	**BCS-042**
Course Title	**:**	**Introduction to Algorithm design**
Assignment Number	**:**	**BCA(IV)/042/Assignment/2024-25**
Maximum Marks	**:**	**100**
Weightage	**:**	**30%**
Last date of Submission	**:**	**31st October, 2024 (For July Session)**
	:	**30th April, 2025 (For January Session)**

This assignment has 8 questions of 10 Marks each, answer all questions. Rest 20 marks are for viva voce. Please go through the guidelines regarding assignments given in the Programme Guide for the format of presentation.

Q1. For the function defined by

$f(n) = 2n^3 + 3n^2 + 1$ and $g(n) = 2n^3 + 1$: show that

(i) $f(n) = \Theta(g(n))$

(ii) $f(n) != \Theta(n^2)$

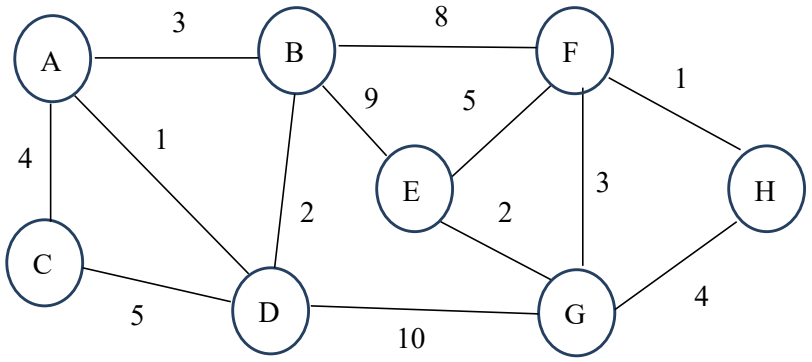
(iii) $n^4 != \Theta(g(n))$

Q2. Find the optimal solution for the knapsack instance n=7 and M=15

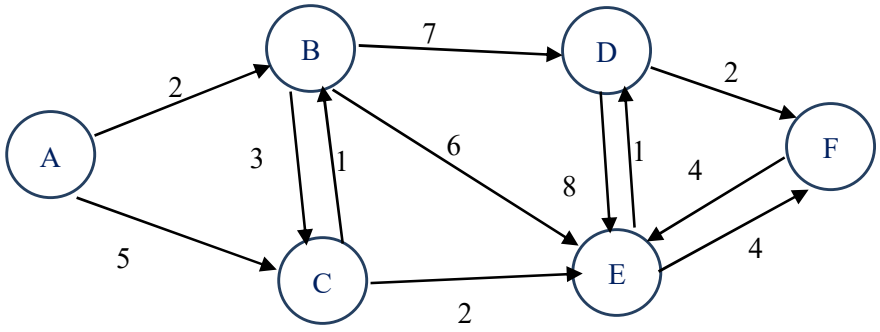
$(P_1, P_2, \text{----------} P_n) = (12, 4, 14, 8, 9, 20, 3)$

$(W_1, W_2, \text{----------} W_n) = (3, 2, 5, 6, 4, 1, 7)$

Q3. Apply Kruskal's Algorithm on the following graph to find minimum cost spanning tree



Q4. Apply Dijkastra's Algorithm to find the shortest path from source vertex 'A' to all other vertices for following graph.



Q5. Analyze best case, average case, and worst-case time complexities of following algorithms with the help of suitable examples.

(i) Insertion sort

(ii) Quick sort
(iii) Binary search
(iv) Selection sort

Q6. Multiply 2146782 x 0422812 using divide and conquer technique(use karatsuba method).
Q7. Explain DFS and BDS graph traversal algorithms with the help of a suitable example.
Q8. Write recurrence relations for matrixmultiplication using Strassen's method andsolve it using the Master method.