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BCS-042

**BACHELOR OF COMPUTER
APPLICATIONS
(BCA) (REVISED)**

Term-End Examination

June, 2026

**BCS-042 : INTRODUCTION TO
ALGORITHM DESIGN**

Time : 2 Hours

Maximum Marks : 50

Note : *Question No. 1 is compulsory and carries
20 marks. Answer any **three** questions
from the rest.*

1. (a) Prove the following proposition using induction : 5

$$P(n) : 1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

- (b) Solve the recurrence relation

$$T(n) = T\left(\left\lceil \frac{n}{3} \right\rceil\right) + T\left(\left\lfloor \frac{2n}{3} \right\rfloor\right) + n$$

using recursion tree method. 5

- (c) Why is analysis of an algorithm important ? Justify your answer with example. 5

- (d) Explain asymptotic notations. Also, discuss what is upper and lower bound in asymptotic notations. 5

2. (a) Write an algorithm for bubble sort and write its worst case and best case analysis. 6

(b) Find $\text{GCD}(595, 252)$ by Euclid's algorithm. 4

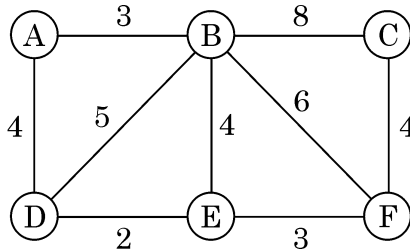
3. (a) Write basic algorithm to evaluate a polynomial and find its complexity. 5

(b) Find the optimal solution for the Knapsack instance $n = 7$ and $m = 15$:

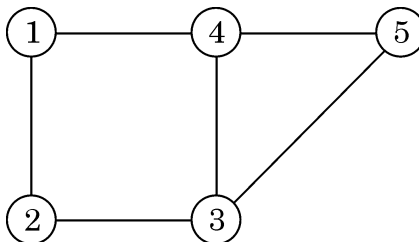
$$(P_1, P_2, P_3, \dots, P_7) = (10, 5, 15, 7, 6, 18, 3)$$

$$(W_1, W_2, W_3, \dots, W_7) = (2, 3, 5, 7, 1, 4, 1)$$

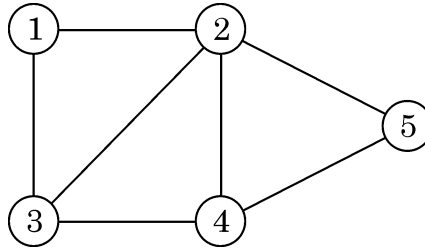
4. (a) Apply Kruskal's and Prim's algorithm to find a minimum cost of a spanning tree of the graph given below : 8



- (b) Define divide and conquer approach. 2
5. (a) What is Adjacency Matrix ? Write adjacency matrix and adjacency list for the following graph. 5



- (b) Write Depth-First Search (DFS) algorithm. Also traverse the following graph using DFS from node 1. 5



x x x x x