K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:III
Class:SY	Program:B.Tech
Branch Code:ADS/COM/CSD	Pattern:2023
Name of Course:Discrete Structures	Course Code:2301201
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 4 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.

Marks CO

Question No. 1

1 Find inverse, converse and contrapositive of the following sentences (6) CO1

1. If a person drives above the speed limit, then they may get a fine.
2. If a student reads daily, then they improve their knowledge.

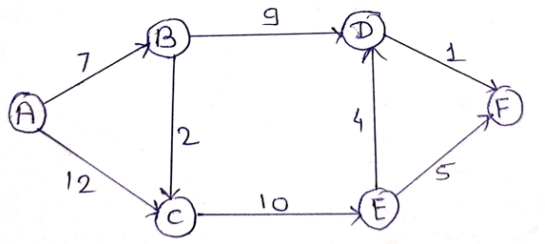
Question No. 2

2 Make use of algebraic laws and show that the following compound statement is a tautology (6) CO2

$[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$

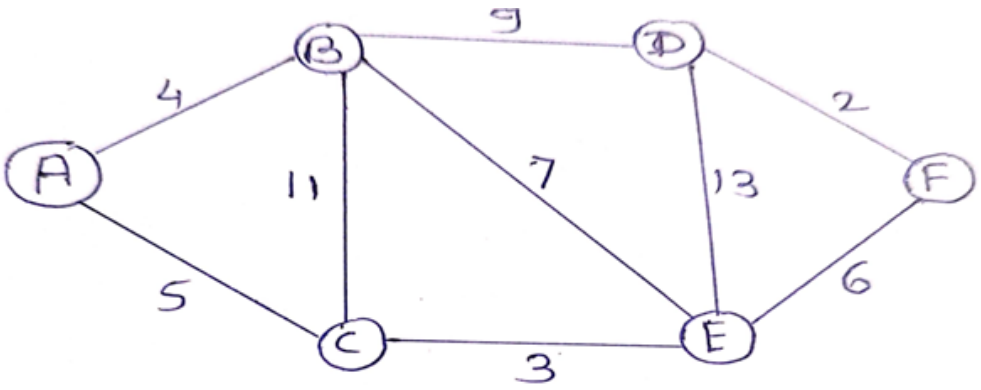
Question No. 3

3.a) Apply Dijkstra's algorithm and find the length of a shortest path between A and F in the given weighted graph. (6) CO3

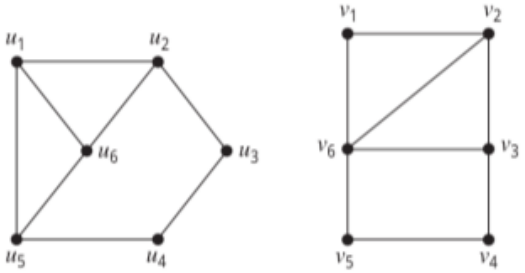


OR

3.b) Apply Dijkstra's algorithm and find the length of a shortest path between *A* and *F* in the given weighted graph. (6) CO3



3.c) Check the following graphs are isomorphic to each other? (5) CO3

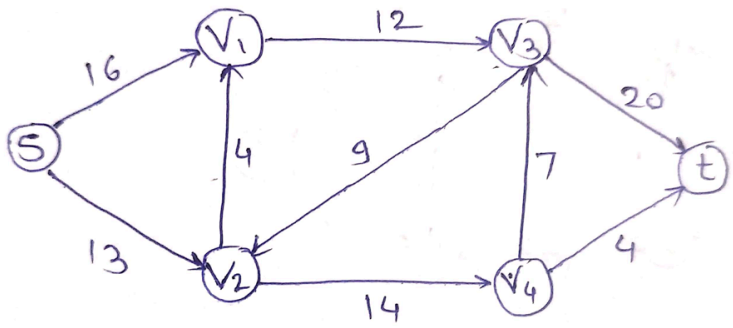


OR

3.d) Apply the concept of a Hamiltonian graph to determine whether the following graph is Hamiltonian. If it is, list one possible Hamiltonian cycle. (5) CO3

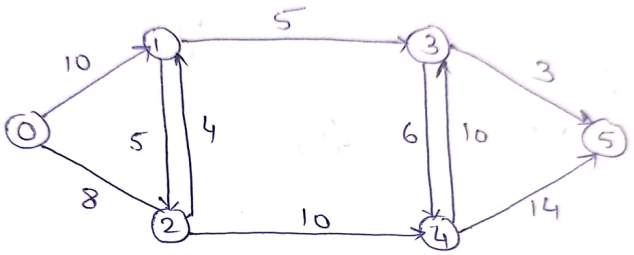
Graph G:
Vertices: V = {A, B, C, D, E}
Edges: E = {AB, AC, AD, BC, BD, CE, DE, EA}

3.e) Determine maximum flow in the transport network shown in following figure (5) CO3



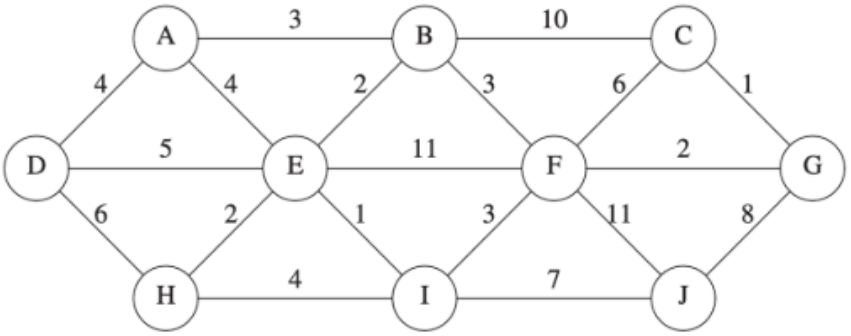
OR

3.f) Determine maximum flow in the transport network shown in following figure (5) CO3



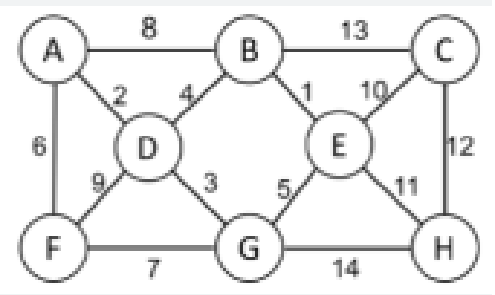
Question No. 4

4.a) Construct the minimum spanning tree (MST) for the given graph using Kruskal's Algorithm. (6) CO4



OR

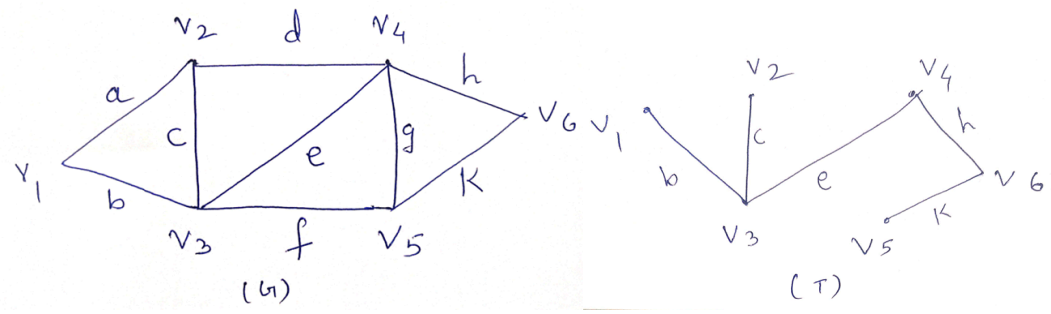
4.b) Construct the minimum spanning tree (MST) for the given graph Prim's algorithm (6) CO4



4.c) Construct Huffman tree to encode the following symbols with the frequencies listed: A: 0.10, B: 0.25, C: 0.05, D: 0.15, E: 0.30, F: 0.07, G: 0.08 What is the average number of bits used to encode a character? (5) CO4

OR

4.d) Find fundamental cut set and fundamental circuit with respect to following figures (5) CO4

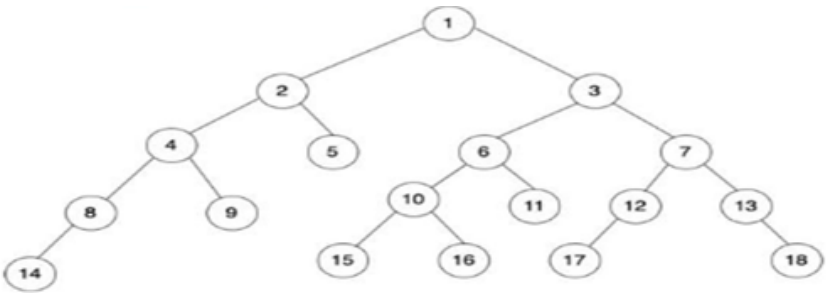


4.e) Construct a binary search tree for the following words, Which is a root, leaf node and interior nodes ? (5) CO4

Math, science, English, Hindi , Biology, Chemistry, Physics, Zoology

OR

4.f) Build the preorder, postorder and inorder traversal of the binary tree as shown below (5) CO4



Question No. 5

5.a) Prove that an algebraic structure (G, *) is an abelian group, where G is the set of non-zero real numbers and * is a binary operation defined by a * b = ab/2. (6) CO5

OR

5.b) Prove that the set R={0,1,2,3,4} is a commutative ring for addition modulo 5 ($+_5$) and multiplication modulo 5(X_5). Is it an integral domain? (6) CO5

5.c) Show that the set G = {0,1,2,3,4,5} is a group with respect to addition modulo 6. (5) CO5

OR

5.d) Prove that (Z, +, ·) is a commutative ring with unity. (5) CO5

5.e) Consider the (2,5) given encoding function e(00) = 10000, e(01)= 11011, e(10)= 01101, e(11)= 11010. (5) CO5

1. Find the minimum distance of e?
2. How many error will e detects?

OR

5.f) Consider the (2,3) given encoding function e(00) =000,e(01)= 011, e(10)= 101, e(11)= 110. (5) CO5

1.Find the minimum distance of e?

2.How many error will e detects?

····· End of question paper·····