Course Code: **23BS3T04**

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II - B.Tech I-Semester Supplementary Examinations (BR23), Mar - 2026

Discrete Mathematics & Graph Theory (CSE, CSE-AI&DS, AI&ML & IT)

Time: 3 hours | Max. Marks: 70

Question Paper consists of Part-A and Part-B

*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Define and discuss the various Connectives used in Propositional Calculus.	(2M)	CO1	BL1
b)	Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent.	(2M)	CO1	BL2
c)	State and prove the principle of Inclusion-Exclusion.	(2M)	CO2	BL2
d)	Explain in briefly about Inversive and Recursive functions with examples?	(2M)	CO2	BL1
e)	Find the number of ways in which five boys and five girls can be seated in a row if the boys and girls are to have alternate seats.	(2M)	CO3	BL2
f)	Find the number of arrangements of the letters of SUCCESS.	(2M)	CO3	BL3
g)	Define an Adjacency Matrix of a graph	(2M)	CO4	BL1
h)	Define an Eulerian Graph.	(2M)	CO4	BL1
i)	What is a Bipartite Graph?	(2M)	CO5	BL1
j)	Define Chromatic Number of a graph.	(2M)	CO5	BL1

PART–B (5X10 = 50M)

2a.	Obtain the PDNF for $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$	(5M)	CO1	BL5
b.	Prove or disprove the validity of the following arguments using the rules of inference. i) All men are fallible ii) All kings are men iii) Therefore, all kings are fallible.	(5M)	CO1	BL4
	(OR)			
3a.	Show that $[p \vee (q \wedge r)] \Leftrightarrow [(p \vee q) \wedge (p \vee r)]$.	(5M)	CO1	BL3
b.	Show that the premises "Everyone in this discrete mathematics class has taken a course in computer science" and "Marla is a student in this class" imply the conclusion "Marla has taken a course in computer science."	(5M)	CO1	BL4
4a.	If $f(x) = 2x + 3$ and $g(x) = x^2 - 3x + 5$, then find fog and gof.	(5M)	CO2	BL5
b.	Draw the Hasse diagram of $(X, \leq)$, where $X = \{2, 3, 6, 12, 24, 36\}$. $Where\ x \leq$y iff x/y	(5M)	CO2	BL3
	(OR)			
5a.	Let A be a given finite set and P(A) its power set. Let ≤ be the inclusion relation on the elements of P(A). Draw Hasse diagrams of (P(A), ≤) for A={a}; A={a,b}; A={a,b,c} andA={a,b.c.d}.	(5M)	CO2	BL4

b. Let R be a binary relation on the set of all positive integers such that R = {(a, b)/a = b^2}. Is R reflexive, symmetric, antisymmetric, transitive, anequivalence relation, or a partial order relation? (5M) CO2 BL4

6a. Solve the recurrence relation $a_n - 2a_{n-1} + a_{n-2} = 2$ with $a_0 = 25, a_1 = 16$ (5M) CO3 BL3

b. Find the number of integer solutions of $x_1 + x_2 + x_3 + x_4 + x_5 = 30$ where $x_1 \geq 2, x_2 \geq 3, x_3 \geq 4$ $x_4, \geq 2$ and $x_5 \geq 0$. (5M) CO3 BL3

(OR)

7a. Solve the following recurrence relation using generating function $a_n - 5a_{n-1} + 6a_{n-2} = 0$ for $n \geq 2$, $a_0 = 0$, $a_1 = -2$. (5M) CO3 BL3

b. Determine the coefficient of $a^2b^3c^2d^5$ in the expansion of (5M) CO3 BL3

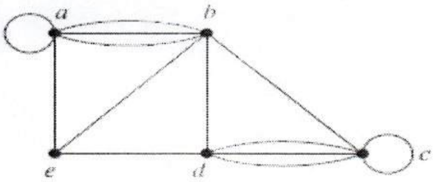
$$(a + 2b - 3c + 2d + 5)^{16}$$

8a. Explain how to find Hamiltonian circuit through an example. (5M) CO4 BL2

b. Prove that the following graphs are isomorphic. (5M) CO4 BL4

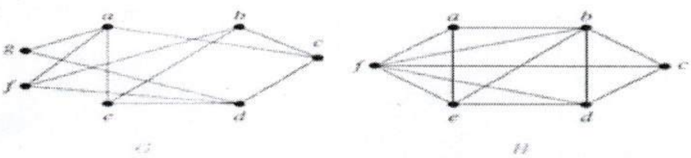
(OR)

9a. Find the number of vertices, the number of edges, and the degree of each vertex in the given undirected graph. Identify all isolated and pendant vertices. 10(M) CO4 BL4



10a. Find the chromatic number of the following i)Cn ii)Kn iii) Km,n (5M) CO5 BL2

b. Are the graphs *G* and *H* bipartite (5M) CO5 BL4



(OR)

11. Discuss in brief about BFS and DFS of a graph. (10M) CO5 BL3

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