Reg. No.															

B.Tech. / M.Tech. (Integrated) DEGREE EXAMINATION, MAY 2024

Fourth and Fifth Semester

21MAB302T – DISCRETE MATHEMATICS

(For the candidates admitted during the academic year 2021-2022 , 2022-2023 & 2023-2024)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part – B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours Max. Marks: 75

PART – A (20 × 1 = 20Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO

1. If A and B are any non-empty sets, then $A \cap (B \cup A)$ is _____ | 1 | 1 | 1 | 2

(A) ϕ (B) A

(C) B (D) $\overline{A} \cap B$

2. If R={(1,1), (1,3), (3,2), (3,4), (4,2)} and S={(2,1), (3,3), (3,4), (4,1)} defined on A={1,2,3,4} then RoS is _____ | 1 | 2 | 1 | 2

(A) {(1,3), (1,4), (3,1), (4,1)} (B) {(1,3), (3,3), (3,1), (4,1)}

(C) {(1,3), (1,4), (3,1), (4,2)} (D) {(1,3), (1,4), (2,1), (3,4)}

3. If $f: A \to B$ *and* $g: B \to C$ are bijective than $(gof)^{-1}$ is _____ | 1 | 1 | 1 | 2

(A) $f^{-1}og^{-1}$ (B) $g^{-1}of^{-1}$

(C) $f^{-1}og$ (D) gof^{-1}

4. Let $f(x) = 2x + 3$ *and* $g(x) = 3x + 2$ be functions on R, then fog is _____ | 1 | 2 | 1 | 2

(A) 3x+7 (B) 6x+11

(C) 6x+7 (D) 3x+11

5. If a/c and b/c with gcd(a,b)=1 then _____ | 1 | 1 | 2 | 2

(A) ab/c (B) c/ab

(C) c/a (D) c/b

6. In how many different ways 7 different beads can be arranged to form a necklace? | 1 | 2 | 2 | 2

(A) 250 (B) 300

(C) 360 (D) 350

7. If gcd(a,b)=1 then gcd(ka,kb)=_____ | 1 | 1 | 2 | 2

(A) 1 (B) k

(C) 2k (D) Does not exist

8. Identify the correct statement | 1 | 2 | 2 | 2

(A) lcm(– 4,14)=28 (B) lcm(– 4,14)= –28

(C) lcm(– 4,14)= –56 (D) lcm(– 4,14)= – 4

9. The converse statement of ⅂p→q is _____ 1 1 3 2

(A) p→q (B) q→⅂p
(C) ⅂p→q (D) p→⅂q

10. What is the dual of (P∨Q)→R is _____ 1 2 3 2

(A) (P∧Q)∧R (B) ⅂(P∨Q)→R
(C) ⅂(P∧Q)∧R (D) (P∨Q)∧⅂R

11. The negation of the statement "I did not have strange dreams" 1 1 3 2

(A) I have a strange dreams (B) I have a peaceful dreams
(C) I have a dreamless sleep (D) I never sleep

12. Which of the following proposition is a tautology? 1 2 3 2

(A) $(p \vee q) \rightarrow p$ (B) $p \vee (q \rightarrow p)$
(C) $p \vee (p \rightarrow q)$ (D) $p \rightarrow (p \rightarrow q)$

13. If e_1, e_2 are 2 identity elements in a group (G, *) then _____ 1 1 4 2

(A) $e_1=0$ (B) $e_2=0$
(C) $e_1=e_2$ (D) $e_1 \neq e_2$

14. The inverse element 'a' in group (G, *) with binary operation a*b=a+b+2 is _____ 1 2 4 2

(A) –a (B) a^{-1}
(C) 2 (D) –(a+4)

15. Every finite integral domain is a _____ 1 1 4 2

(A) Field (B) Ring
(C) Integral domain (D) Group

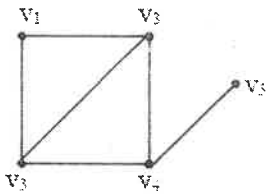
16. The Hamming weight of x=111010 1 2 4 2

(A) 3 (B) 2
(C) 4 (D) 6

17. A graph in which loops and parallel edges are allowed is called _____ graph 1 1 5

(A) Pseudo (B) Multi
(C) Simple (D) Bipartite

18. The degree of v_5 in the following graph is _____ 1 2 5 2

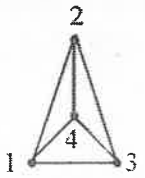


(A) 3 (B) 2
(C) 1 (D) 0

19. A connected graph without any circuit is called _____ 1 1 5 2

(A) Leaf (B) Flower
(C) Loop (D) Tree

20. The chromatic number for the following graph is _____ 1 2 5 2



(A) 4 (B) 3
(C) 2 (D) 1

PART – B (5 × 8 = 40 Marks)

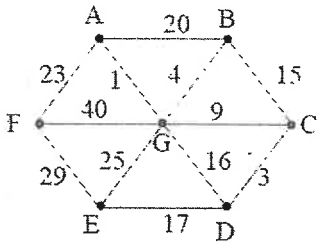
Answer **ALL** Questions

		Marks	BL	CO	PO
21. a.	If A, B and C are sets, prove both set identities and analytically, that $A\cap(B-C)=(A\cap B)-(A\cap C)$.	8	3	1	2
	(OR)				
b.	Draw the Hasse diagram representing the partial ordering P={(a,b)/'a divides b'} on the set {1,2,3,4,5,6,7,8} starting from the digraph of P and also prove that P is partial ordered relation.	8	3	1	2
22. a.	There are 250 students in an engineering college of these 188 have taken a course in Fortran, 100 have taken a course in C and 35 have taken a course is Java further 88 have taken courses in both Fortran and C. 23 have taken courses in both C and Java and 29 have taken courses in both Fortran and Java. If 19 of these students have taken all the three courses, how many of these 250 students have not taken a course in any of these three languages?	8	3	2	2
	(OR)				
b.	Use Euclidean algorithm to find the integers 'm and n' such that 28844m+15712n=4.	8	3	2	2
23. a.	Show that b can be derived from the premises a→b,c→b,d→(a∨c),d by the indirect method.	8	4	3	2
	(OR)				
b.	Prove that the premises p→q, q→r, s→¬r and p∧s are inconsistent.	8	4	3	2
24. a.	Prove that the necessary and sufficient condition for a non empty subset H of a group (G,*) to be a subgroup is a,b∈H⇒a*b^{-1}∈H.	8	3	4	2
	(OR)				
b.	Find the code words generated by the parity check matrix $H=\begin{pmatrix}1&1&0\\0&1&1\\1&0&0\\0&1&0\\0&0&1\end{pmatrix}$, when the encoding function is $R:B^3\to B^5$.	8	3	4	2

25. a. Prove that the maximum number of edges in a simple disconnected graph G with n vertices and k components is $\frac{(n-k)(n-k+1)}{2}$. | 8 | 4 | 5 | 2

(OR)

b. Find the minimum spanning tree for the following weighted graph using Kruskal's algorithm. | 8 | 4 | 5 | 2



PART – C (1 × 15 = 15 Marks)

Answer **ANY ONE** Questions

Marks	BL	CO	PO

26. Let R={(1,2), (1,5), (2,2), (3,3), (3,4), (4,4), (5,1)} defined on A={1,2,3,4,5} then find the transitive closure of R using Warshall's algorithm. | 15 | 4 | 1 | 2

27. Find the code words generated by the generator matrix $G=\begin{bmatrix}1 & 0 & 0 & 1 & 1\\ 0 & 1 & 1 & 1 & 0\end{bmatrix}$, find the corresponding parity check matrix and use it to decode the following received words and hence find the original message | 15 | 4 | 4 | 2

Are all the words decoded uniquely?

(i) 11110
(ii) 11101
(iii) 11011
(iv) 10101
(v) 10011
(vi) 11111
(vii) 01100

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