(OR)

b. Find the number of integers between 1 and 500 both inclusive that are not divisible by 7, 3 or 5. — 12 3 2 2

30. a.i. Without using truth tables, prove that $(\neg p \vee q) \wedge (p \wedge (p \wedge q)) \equiv p \wedge q$. — 6 3 3 2

ii. Show that $(a \vee b)$ can be logically derived from the premises $p \vee q, (p \vee q) \rightarrow \neg r, \neg r \rightarrow (s \wedge \neg t)$ *and* $(s \wedge \neg t) \rightarrow (a \vee b)$. — 6 3 3 2

(OR)

b. Using rules of inference show that the following set of premises is inconsistent. — 12 3 3 2
If Rama gets his degree, he will go for a job
If he goes for a job, he will get married soon
If he goes for higher study, he will not get married
Rama gets his degree and goes for higher study

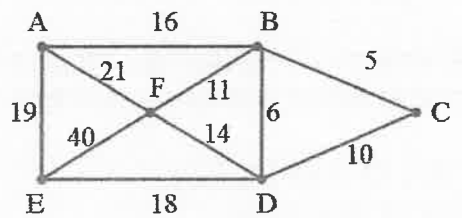
31. a.i. Prove that the intersection of two sub groups of a group G is also a subgroup of G. Give an example to show that the union of two sub groups of G need not be a sub group of G. — 8 3 4 1

ii. If R and C are additive groups of real and complex numbers respectively and if the mapping $f: C \rightarrow R$ is defined by $f(x+iy) = x$. Show that f is a homomorphism. — 4 3 4 1

(OR)

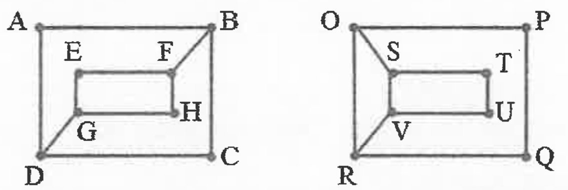
b. Find the code words generated by the encoding function $e: B^2 \rightarrow B^5$ with respect to the parity check matrix $H = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$. — 12 3 4 2

32. a. Find the minimum spanning tree for the weighted graph using Kruskal's algorithm. Also determine the minimum total weight. — 12 3 5 2



(OR)

b.i. Determine whether the following graphs are isomorphic — 8 3 5 2



ii. Prove that an undirected graph is a tree, if and only if, there is a unique path between every pair of vertices. — 4 3 5 2

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Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2023
Fifth Semester

18MAB302T – DISCRETE MATHEMATICS FOR ENGINEERS
(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

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 & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer **ALL** Questions

Marks BL CO PO

1. $(A-C) \cap (C-B)$ is — 1 2 1 1
(A) A (B) $(A \cup B) \cap C$
(C) φ (D) C

2. If A={1,2,3} and R is a relation on A given by a+b=even then R is — 1 2 1 2
(A) {(1,1) (1,3) (2,2) (3,1)} (B) {(1,3) (2,2) (3,1)}
(C) {(1,1) (1,3) (2,2) (3,1) (3,3)} (D) {(1,1) (2,2) (3,3)}

3. If S={1,2,3,4,5} and if the functions $f, g: S \rightarrow S$ then fog is — 1 2 1 2
(A) {(1,4) (2,3) (3,2) (4,1) (5,2)} (B) {(1,4) (2,3) (3,2) (5,5) (4,2)}
(C) {(1,4) (3,2) (5,5) (2,4) (4,2)} (D) {(1,4) (2,3) (3,2) (4,1) (5,5)}

4. If A={1,2,3} such that (a,b)∈R if a+b=even then $M_{R^{-1}}$ — 1 2 1 2
(A) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
(C) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

5. In how many ways can 6 boys and 4 girls sit if the girls are to sit together? — 1 2 2 2
(A) 6! 4! Ways (B) 7! 4! Ways
(C) 2×6! Ways (D) 2×4! Ways

6. In the generalization of a pigeonhole principle if the n pigeons are accommodated in 'm' holes then — 1 2 2 1
(A) n≤m (B) n≥m
(C) n<m (D) n>m

7. If no distinction is made between clockwise and counter clockwise direction, then the number of different circular arrangements is 1 2 2 2

(A) $(n-1)!$ (B) $\frac{1}{2}(n-1)!$
(C) $(n+1)!$ (D) $(n-2)!$

8. If n>1 is a composite number and p is a prime factor of n, then 1 2 2 2

(A) $p \le \sqrt{n}$ (B) $p \le n$
(C) $p \ge \sqrt{n}$ (D) $p \ge n$

9. $(p \to q) \vee (p \to r)$ is equivalent to 1 2 3 2

(A) $p \to (q \wedge r)$ (B) $q \to p$
(C) $p \to q$ (D) $p \to (q \vee r)$

10. $p \to q$ is logically equivalent to 1 2 3 2

(A) $\neg p \to \neg q$ (B) $\neg q \to p$
(C) $\neg p \wedge q$ (D) $\neg p \vee q$

11. The ________of a proposition is generally formed by introducing the word "if, then" at the place. 1 2 3 1

(A) Conjunction (B) Disjunction
(C) Negation (D) Conditional

12. What is the contrapositive the following assertion? I stay only if you go. 1 2 3 2

(A) I stay if you go (B) If you do not go then I do not stay
(C) If I stay then you go (D) If you do not stay then I go

13. In a group G={1, –1, i, –i} under multiplication order of the element $-i$ is 1 2 4 2

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

14. In the cyclic group G={1,–1, i, –i} under multiplication its generators are 1 2 4 2

(A) {1, i} (B) {1, –i}
(C) {–1, i} (D) {i, –i}

15. Every finite integral domain is 1 2 4 2

(A) A ring (B) A field
(C) A commutative ring (D) A monoid

16. If {G,*} and {G',Δ} are two groups then a mapping $f: G \to G'$ is called a group homomorphism if for all a, b $\in$G 1 2 4 2

(A) $f(a*b) = f(a) + f(b)$ (B) $f(a*b) = f(a)$
(C) $f(a*b) = f(b)$ (D) $f(a*b) = f(a) \Delta f(b)$

17. A graph in which parallel edges are allowed is called 1 2 5 1

(A) Pseudo graph (B) Multi graph
(C) Simple graph (D) Null graph

18. A circuit of a graph G is called ________ circuit if it includes each edge of G exactly once 1 2 5 1

(A) Hamiltonian (B) Eulerian
(C) Simple graph (D) Tree

19. A tree with 'n' vertices has _____edges 1 2 5 2

(A) nC_2 (B) nP_2
(C) $n-1$ (D) $n!$

20. The chromatic number of a cycle with even length is 1 2 5 2

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

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

Marks BL CO PO

21. If f,g,h:R→R are defined by $f(x) = x^2 - 4x, g(x) = \frac{1}{x^2+1}$ *and* $h(x) = x^4$ find $(fo(goh))x$ *and* $((fog)oh)x$. 4 3 1 1

22. How many positive integers n can be formed using the digits 3, 4, 4, 5, 5, 6, 7 if n has to exceed 50,00,000. 4 3 2 2

23. Construct truth table to determine the following compound proposition $(q \to \neg p) \leftrightarrow (p \leftrightarrow q)$ 4 3 3 2

24. Prove that every cyclic group is abelian. 4 3 4 1

25. Show that in an undirected graph with 'e' edges, $\sum_i \deg(v_i) = 2e$. 4 3 5 1

26. Draw Hasse diagram for the partial ordering "$x \le y \Leftrightarrow x$ divides y" on $s = \{1,2,3,4,6,8,12\}$, 4 3 1 2

27. If we select 10 points in the interior of an equilateral triangle of side 1, show that there must be at least 2 points whose distance is less than 1/3. 4 3 2 2

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

Marks BL CO PO

28. a. If A={1,2,3,4,5} and R is the relation on A defined by R{(1,2) (2,1) (2,3) (3,4) (4,2) (4,4) (5,1) (5,5)}. Find the transitive closure of R using Warshall's algorithm. 12 3 1 2

(OR)

b. If $f: A \to B$ *and* $g: B \to C$ are invertible functions, then $gof: A \to C$ is also invertible and $(gof)^{-1} = f^{-1}og^{-1}$. 12 3 1 1

29. a. Use the Euclidean algorithm to find gcd(512,320) and express the gcd as a linear combination of m, n of the given numbers and also find m and n. 12 3 2 2