(6 pages) **Reg. No. :** .....

Code No. : 30442 E **Sub. Code : CEMA 52**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2024.

Fifth Semester

Mathematics

Major Elective — DISCRETE MATHEMATICS

(For those who joined in July 2021-2022 only)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. The conjuction of the two statements P and Q is denoted by

   (a) $P \vee Q$ (b) $P \wedge Q$

   (c) $\neg P \vee Q$ (d) $P \vee \neg Q$

2. The inverse of $P \to Q$ is

   (a) $Q \to P$ (b) $\neg P \to \neg Q$

   (c) $\neg Q \to \neg P$ (d) None of these

3. Which one of the following is elementary product?

   (a) $\neg P \wedge Q$ (b) $\neg Q \vee P$

   (c) $\neg P \vee Q$ (d) $Q \vee \neg P$

4. Which one of the following is implications?

   (a) $\neg\neg P \Leftrightarrow P$ (b) $P \vee P \Leftrightarrow P$

   (c) $P \wedge P \Leftrightarrow P$ (d) $P \wedge Q \Rightarrow P$

5. The semigroup also satisfies the identity property is called

   (a) group (b) code

   (c) monoid (d) none of these

6. The group $\langle S_3, 0 \rangle$ is of order

   (a) 3 (b) 6

   (c) 5 (d) 0

7. The value of $a \oplus (a * b)$ is

   (a) a (b) $a \oplus b$

   (c) $a * b$ (d) $a + b$

8. If $<B,*,\oplus,0,1)$ is a bounded lattice and $a \in B$ then

(a) $a*0=1$ (b) $a*0=0$

(c) $a \oplus 1=0$ (d) none of these

9. The base of the decimal number system is

(a) 10 (b) 8

(c) 6 (d) 2

10. The corresponding octal number of the binary 001 is

(a) 0 (b) 1

(c) 2 (d) 3

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Write a short note on disjunction.

Or

(b) Construct the truth table for $(P \to Q) \wedge (Q \to P)$.

12. (a) Obtain the disjunctive normal forms of $\neg(P \vee Q) \rightleftarrows (P \wedge Q)$.

Or

(b) Show that $\neg P \wedge \neg Q \Rightarrow \neg(P \wedge Q)$.

13. (a) Define the following (i) Group (ii) Semi group.

Or

(b) Explain the error recovery in Group code.

14. (a) Write some properties of lattices.

Or

(b) Prove that every chain is a distributive lattice.

15. (a) Convert $(367.52)_8$ into binary.

Or

(b) Multiply $(1101)_2$ by $(110)_2$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

16. (a) Explain the well defined formulas.

Or

(b) Show that

$(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge Q) \Leftrightarrow R$.

17. (a) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q, Q \rightarrow R$, $P \rightarrow M$ and $\neg M$.

Or

(b) Show that

$(x)(P(x) \vee Q(x)) \Rightarrow (x)P(x) \vee (\exists x)Q(x)$.

18. (a) State and prove Lagrange's theorem.

Or

(b) Explain the generation of codes.

19. (a) State and prove distributive inequalities.

Or

(b) Explain the Boolean algebra and its properties.

20. (a) Explain the binary number system.

Or

(b) Explain the BCD in detail.

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