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Reg. No. :

Code No. : 20083 E Sub. Code : SEMA 5 B/
AEMA 52

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

Fifth Semester

Mathematics

Major Elective — DISCRETE MATHEMATICS

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer

1. The statement Q is called the _____ in $P \rightarrow Q$
- (a) antecedent (b) consequent
(c) tautologies (d) None

2. If P and Q are two statements, then the statement $P \rightarrow Q$ is called _____
- (a) Conditional statement
(b) Biconditional statement
(c) Simple statement
(d) None
3. Every axiom is a _____
- (a) lemma (b) statement
(c) theorem (d) formula
4. A sum of the variables and their negations is called on _____
- (a) elementary sum (b) elementary product
(c) normal sum (d) none
5. A group $\langle G, * \rangle$ in which the operation $*$ is commutative is called an _____ group.
- (a) semi (b) subgroup
(c) abelian (d) none
6. Semigroup $\langle M, 0 \rangle$ with an identity element with respect to the operation 0 is called a _____.
- (a) monoid (b) group
(c) abelian (d) permutation

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7. Every _____ is a distributive lattice.
- (a) chain (b) group
(c) bounds (d) homomorphism
8. A _____ algebra is a complemented, distributive lattice.
- (a) Boolean (b) Partial
(c) Ordinary (d) None
9. What are the numbers using for represent octal number?
- (a) 0-9 (b) 0-1
(c) 0-7 (d) none
10. Subtract 01110 from 10101?
- (a) 11001 (b) 100100
(c) 00111 (d) 11001

PART B — (5 × 5 = 25 marks)

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

11. (a) Construct the truth table for Biconditional.
- Or
- (b) Construct the truth table for $(P \vee Q) \vee \neg P$

12. (a) Symbolize the statement: "All men are giants".
- Or
- (b) Prove that $(\forall x)(P(x) \wedge Q(x)) \Rightarrow (\forall x)P(x) \wedge (\forall x)Q(x)$.
13. (a) Show that the kernel of a homomorphism g from a group $\langle G, * \rangle$ to $\langle H, \Delta \rangle$ is a subgroup of $\langle G, * \rangle$.
- Or
- (b) Prove that the parity — check matrix H generates a code word of weight q if there exists a set of q columns of H such that their k -tuple sum is zero.
14. (a) Let $\langle L, *, \oplus \rangle$ be a distributive lattices. Then prove that for any $a, b, c, \in L, (a * b = a * c) \wedge (a \oplus b = a \oplus c) \Rightarrow b = c$
- Or
- (b) Prove the Boolean identity $(A + B)(A + C) = A + BC$.
15. (a) Convert $(101010101)_2$ to hexadecimal.
- Or
- (b) Divide 100001 by 110?

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

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

16. (a) Construct the truth table for $(Q \wedge (P \rightarrow Q)) \rightarrow P$.

Or

- (b) Does the formula $(\neg Q \wedge P) \wedge Q$ is tautology or not.

17. (a) Obtain the principal disjunctive norm forms of

- (i) $\neg P \vee Q$,
(ii) $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$

Or

- (b) Does P follows from $(P \vee Q)$.

18. (a) Write a definition of Group and subgroup.

Or

- (b) Prove that the minimum weight of the nonzero code words in a group code is equal to minimum distance.

19. (a) If any Boolean algebra, show that $a = b \Leftrightarrow ab' + a'b = 0$.

Or

- (b) When $\langle B, *, \oplus \rangle$ becomes a lattice.

20. (a) Convert the following to octal numbers
(i) 110101110₂ (ii) 111101.01101₂

Or

- (b) Multiply :

- (i) 1.01×10.1
(ii) 100101×1001
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