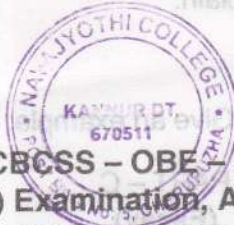Reg. No. : ....

Name : ....

IV Semester B.C.A. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, April 2024
(2019 to 2022 Admissions)
GENERAL AWARENESS COURSE
4A14BCA : Discrete Mathematical Structures

Time : 3 Hours   Max. Marks : 40

PART – A
(Short Answer)

Answer **all** questions.   (6×1=6)

1. Define complement of a set.

2. What is meant by contingency in propositional logic ?

3. Define symmetric relation.

4. What is a monoid ? Give an example.

5. What is a connected graph ?

6. Define planar graph.

PART – B
(Short Essay)

Answer **any 6** questions.   (6×2=12)

7. Rewrite the set S = {5, 10, 15, 20, 25, 30} in set builder form.

8. Explain conjunctive normal forms.

9. Define asymmetric relation. Give example.

10. Define NAND gate.

11. Define the terms converse, inverse and contra positive in propositional logic.

P.T.O.

12. What is an Abelian group ? Explain.

13. Define minimum spanning tree.

14. What is an isomorphic graph ? Give an example.

PART – C
### (Essay)

Answer **any 4** questions. (4×3=12)

15. Define relation and explain various types of relations.

16. Define complete bipartite graphs. Draw an example for complete bipartite graph $k_{2,3}$.

17. Prove that "sum of degrees of vertices of any finite graph is even".

18. Evaluate the prefix expression +−*3 2/8 4 1.

19. Differentiate between the adjacency matrix and incidence matrix.

20. Show that $(-(p \vee q)) \vee (-p \wedge q)$ is logically equivalent to $-p$.

PART – D
(Long Essay)

Answer **any 2** questions. (2×5=10)

21. Define equivalence relation. Show that the congruence relation on the set of integers is an equivalence relation.

22. Explain Hamiltonian circuit. Show that the below graph has not a Hamilton circuit.
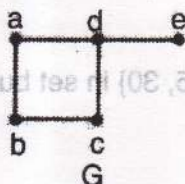
23. Discuss the travelling salesman problem with example.

24. State and prove the basic laws and theorems of Boolean algebra.

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IV Semester B.C.A. Degree (CBCSS – OBE – Regular/Supplementary/
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(2019 Admission Onwards)
GENERAL AWARENESS COURSE
4A14BCA : Discrete Mathematical Structures

Time : 3 Hours   Max. Marks : 40

PART – A
(Short Answer)

Answer **all** questions.   (6×1=6)

1. Define tautology.

2. Define equivalence relation.

3. How many relations are there on a set with 'n' elements ?

4. Define Boolean variable.

5. Find the value of x if $x + x = 0$.

6. Define Euler path.

PART – B
(Short Essay)

Answer **any 6** questions.   (6×2=12)

7. Define 'directed multigraphs'.

8. What is a 'decision tree' ?

P.T.O.

9. What is 'OR gate' ?

10. Determine whether the following statements are true or false :

    a) $0 \in \phi$

    b) $\phi \subset \{0\}$.

11. Find A – B and B – A if A = {1, 2, 3, 4, 5} and B = {0, 3, 6}.

12. Write and converse and inverse of $p \rightarrow q$.

13. What do you mean by fallacy ?

14. Define Antisymmetric Relation.

PART – C
(Essay)

Answer **any 4** questions. (4×3=12)

15. Let R be a reflexive and transitive relation. Prove that $R^n = R$ for all positive integers n.

16. Explain 'complete graphs'. Draw complete graph with number of vertices 5 and 6.

17. Prove that an undirected graph has an even number of vertices of odd degree.

18. What is the value of the postfix expression ?

    $7\ 2\ 3\ *\ -\ 4\ \uparrow\ 9\ 3\ /\ +\ ?$

19. Define Cartesian product of two sets. Show that $A \times B \neq B \times A$ with the help of a suitable example.

20. Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences.

P.T.O.

PART – D
(Long Essay)

Answer **any 2** questions. (2×5=10)

21. Let p : "Swimming at the shore is allowed".

    q : "Sharks have been spotted near the shore".

    Express each of these propositions as sentences

    a) $p \land q$

    b) $p \rightarrow \neg q$

    c) $p \leftrightarrow \neg q$

    d) $\neg p \rightarrow \neg q$

    e) $\neg p \land (p \lor \neg q)$.

22. Explain Hamilton circuits with examples. Show that K_n has a Hamilton circuits whenever $n \geq 3$.

23. Explain Depth First Search method to build a spanning tree with suitable example.

24. State and prove De Morgan's laws and distributive laws using membership table.

PART – B
(Short Essay)

Answer any 6 questions. (6×2=12)

7. Define 'directed multigraphs'.

8. What is a 'decision tree' ?

P.T.O.

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Reg. No. : ....

Name : ....

**IV Semester B.C.A. Degree CBCSS (OBE) Regular/Supplementary/
Improvement Examination, April 2022
(2019 Admission Onwards)
GENERAL AWARENESS COURSE
4A14BCA : Discrete Mathematical Structures**

Time : 3 Hours   Max. Marks : 40

PART – A
(Short Answer)

Answer **all** questions.   (6×1=6)

1. Define set.

2. Define Tautology.

3. Distinct elements of A are mapped into distinct elements of B is called

4. Pictorial representation of a finite partial order on a set is called

5. A graph which allows more than one edge to join a pair of vertices is called a

6. A path of graph G, that includes each edge of G exactly once and intersects each vertex of G at least once is called

PART – B
(Short Essay)

Answer **any 6** questions.   (6×2=12)

7. Determine the truth table of ~p (q p).

8. Let p be "He is tall" and q be "He is handsome". Write each of the following statements in symbolic form using p and q :
   a) He is tall and handsome.
   b) He is neither tall nor handsome.

9. Find conjunctive normal form of p (p q).

10. Brief note on disjunctive normal form.

11. Prove that $\forall a \in B$, $a \cdot a = a$.

12. Simplify z(y + z) (x + y + z).

13. Define Tree with example.

14. What is Hamiltonian graph ?

PART – C
(Essay)

Answer **any 4** questions. (4×3=12)

15. Illustrate the following identities by means of Venn diagrams.
    a) A (B C) = (A B) (A C)
    b) (A B).

16. Write down any three properties of complementation of sets.

17. Define inverse mapping with example.

18. Explain Pigeonhole principle.

19. Explain Travelling salesman's problem.

20. Define BFS for a graph and explain with example.

PART – D
(Long Essay)

Answer **any 2** questions. (2×5=10)

21. Prove that a graph is connected if and only if it has a spanning tree.

22. Show that (p r) (q r) and (p q) r are not logically equivalent.

23. Let A, B, C are the sets. Prove that A – (B – C) = (A – B) – C if and only if $A \cap C = \phi$.

24. If f : AB and g : BC are bijections, then prove that gof : AC is also a bijection.

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Reg. No. : ....

Name : ....

IV Semester B.C.A. Degree CBCSS (OBE) Regular Examination, April 2021
(2019 Admission Only)
General Awareness Course
4A 14 BCA : DISCRETE MATHEMATICAL STRUCTURES

Time : 3 Hours   Max. Marks : 40

PART – A
(Short Answer)

Answer **all** questions.   (6×1=6)

1. A set with no elements is called _____

2. Define proposition.

3. a. a = ?

4. Define onto mapping.

5. Let G = (V, E) be a graph. If the elements of E are ordered pairs of vertices, then the graph G is called _____

6. What is planar graph ?

PART – B
(Short Essay)

Answer **any 6** questions.   (6×2=12)

7. Determine the truth table of ~p (q p).

8. Let p be "it is cold" and q be " it is raining". Give a simple verbal sentence which describes each of the following :

   a. ~p

   b. ~p ∧ ~q

9. Define Hasse diagram.

10. Define relation from A to B with example.

11. Describe laws of Boolean Algebra.

12. Simplify F = + + A + AB.

13. Define complete graph with example.

14. What is graph coloring ?

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PART – C
(Essay)

Answer **any 4** questions. (4×3=12)

15. Prove that $(p \wedge q) p$ is tautology.

16. A = {1, 2}, B = {1, 2, 4, 5}, C = {5, 7, 9, 10}. Find the following :

    a) $(A \cup B) \cup C$

    b) $(A \cap B) \cap C$

    c) $(A \cup B) \cap C$.

17. Prove that the theorem : Let f : A B then g : B be both one-one and onto functions, then gof : A C is also one-one and onto.

18. Simplify Y = (P + Q) (P + Q') (P' + Q).

19. Prove that K_5 is non planar graph.

20. The adjacency structure of a graph G is given as G = [A : B, E; B : A, E, F, G; C : D, G, H; D : C, H; E : A, B; F : G; G : B, C, F; H : C, D].

PART – D
(Long Essay)

Answer **any 2** questions. (2×5=10)

21. Compare DFS and BFS graph.

22. Describe shortest paths in weighted graphs.

23. Without using truth tables prove that $(\sim p \vee q) \wedge (p \wedge (p \wedge q)) = p \wedge q$.

24. Write down the properties of Union operations in sets.

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