

**2022**

*Time : 3 hours*

*Full Marks : 60*

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Answer from both the Groups as directed.*

**Group – A**

**(Compulsory)**

1. Choose the correct answer from the given alternatives:  $1 \times 10 = 10$

(a) A compound proposition that is always \_\_\_\_\_ is called a tautology.

✓(i) True

(ii) False

(b) The Cardinality of the set  $A = \{1, 2, 3, 4, 5, 6\}$  is :

(i) 5

✓(ii) 6

- (iii) Integer
- (iv) None of these
- (c) The minimum number of edges in a connected cyclic graph on  $n$  vertices is :
- ✓ (i)  $n - 1$
  - (ii)  $n$
  - (iii)  $2n + 3$
  - (iv)  $n + 1$
- (d) A \_\_\_\_\_ is an ordered collection of objects.
- (i) Relation
  - (ii) Function
  - (iii) Set ✓
  - (iv) Proposition
- (e) The cartesian product  $B \times A$  is equal to the cartesian product  $A \times B$ .
- (i) True
  - (ii) False
- (f) Power set of empty set has exactly \_\_\_\_\_ subset.
- (i) One ✓
  - (ii) Two

- (iii) Three
  - (iv) Zero
- (g) In a \_\_\_\_\_ the vertex set and edge set are finite sets.
- ✓(i) Finite graph
  - (ii) Bipartite graph
  - (iii) Infinite graph
  - (iv) Connected graph
- (h) A \_\_\_\_\_ graph is a connected graph whose all vertices are of even degree.
- (i) Euler
  - (ii) Hamiltonian
  - (iii) Planar
  - (iv) None of these
- (i) An \_\_\_\_\_ relation is reflexive, symmetric and transitive.
- (i) Equivalence
  - (ii) Isometric
  - (iii) Isotropic
  - (iv) None of these
- (j) A \_\_\_\_\_ is said to be binary if each node in it has either 0, 1, or 2 child nodes.
- ✓(i) Tree

- (ii) Graph
- (iii) Matrix
- (iv) None of these

2. State and prove De Morgan's Law. 5

### Group – B

Answer any three questions of the following :

15×3 = 45

- 3. Define a set. What are the basic operation that can be performed on a set?
- 4. Define a graph. Discuss the graph representation techniques.
- 5. What is a spanning tree ? Explain Prim's Algorithm to find a spanning tree.
- 6. Explain the logical connectives And, Or, Not giving examples.
- 7. What is a Tree ? Explain the terms :
  - (a) Degree of a node
  - (b) Height of a tree
  - (c) Siblings
  - (d) Leaf
  - (e) Root node

