



- a)  $2x^2 + 11x + 9$   
 c)  $x^2 + 11x + 9$
- (viii) If  $f(x - 2) = 2x^2 + 3x - 5$  then  $f(-2) =$ . Write the correct option  
 a) -5  
 c) -1  
 b)  $2x^2 - 11x + 9$   
 d) None of these
- (ix) The degree of an isolated vertex is, Write the correct option  
 a) 0  
 c) 2  
 b) 1  
 d) none of these
- (x) Select the correct one, let p and q be two propositions. If p and q are both false then  $p \leftrightarrow q$  is  
 a) T  
 c) Both T and F  
 b) F  
 d) None of these
- (xi) A complete graph must be a, Write the correct option  
 a) circuit  
 c) non-simple graph  
 b) regular graph  
 d) null-graph
- (xii) Select the correct one, let p and q be two propositions. If p is false and q is true then  $p \leftrightarrow q$  is  
 a) T  
 c) Both T and F  
 b) F  
 d) None of these
- (xiii) Select the correct one, The truth table of the propositional formula of n variables will be ..... number of rows.  
 a) 4  
 c)  $2^n$   
 b)  $2^{n-1}$   
 d) None of these
- (xiv) The function  $f : R \rightarrow R$  defined by  $f(x) = x^4$ , where R is the set of all real numbers. Then f is, Select the correct option  
 a) surjective  
 c) bijective  
 b) injective  
 d) None of these
- (xv) Select the correct one, let p and q be two propositions if truth value of p is T and truth value of q is T then  $\sim p \wedge q$  be  
 a) T  
 c) Both T and F  
 b) F  
 d) None of these

#### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Establish that the function  $f: R \rightarrow R, f(x) = 3x - 1$  is surjective. (3)
3. Let  $H = \{(a, b) \in G: b > 0\}$ . Show that H is a subgroup of G. (3)
4. Examine  $q \rightarrow p$  and  $\sim p \vee q$  are logical equivalence (3)
5. Describe Tautology, with an example (3)
6. Illustrate that the left identity is also right identity (3)

OR

Illustrate that for an associative algebraic structure, the inverse of every invertible element is unique. (3)

**Group-C**  
(Long Answer Type Questions)

5 x 8=40

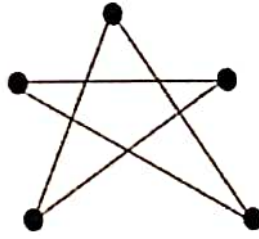
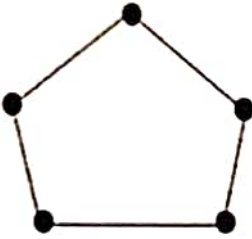
7. Illustrate that (5)

Let  $(G, \circ)$  be a group. A non – empty subset  $H$  of  $G$  forms a subgroup of  $(G, \circ)$  iff

$$a, b \in H \Rightarrow a \circ b^{-1} \in H$$

8. There are 12 bulbs in a room each of which is operated independently by 12 different switches. Observe how many ways the room can be illuminated? (5)

9. Examine whether the following two graphs are isomorphic or not: (5)

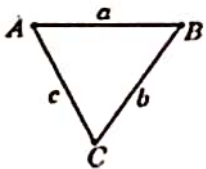


10. Describe De Morgan's theorem in Boolean Algebra. (5)

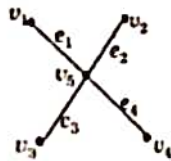
11. What is Tautology and visualize that  $\sim(p \vee q)$  is not a tautology (5)

12. What is Contradiction and visualize that  $\sim p \vee q$  is not a contradiction (5)

13. (5)



(ii)



Examine these two graphs are bipartite or not

14. Illustrate that in a group  $(G, \circ)$ , for all  $a, b$  in  $G$ , each of equations  $a \circ x = b$  and  $y \circ a = b$  has a unique solution in  $G$ . (5)

OR

Let  $(G, \circ)$  and  $(G', *)$  be two groups and  $\varphi: G \rightarrow G'$  be a homomorphism. Then

(5)

Deduce that: (i)  $\varphi(e_G) = e_{G'}$

(ii)  $\varphi(a^{-1}) = \{\varphi(a)\}^{-1}$  for all  $a \in G$

(iii) if  $a \in G$  and  $o(a)$  is finite then  $o(\varphi(a))$  is a divisor of  $o(a)$

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