



- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

Answer ALL Questions

(10 X 10 = 100 Marks)

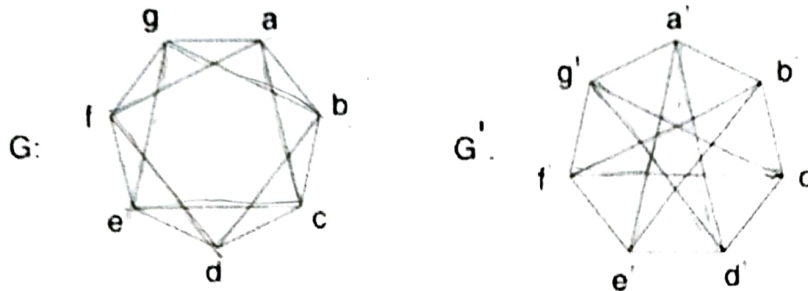
1. i) Define a decision problem and explain the possible solutions. Examine whether $\{(pvq) \rightarrow r\} \leftrightarrow \{\neg r \rightarrow \neg(pvq)\}$ is a tautology, by the truth table. [4]
 ii) Compute PDNF and hence deduce PCNF of the statement formula $(p \wedge q) \vee (\neg p \wedge r) \vee (q \wedge r)$. [6]
2. Write the negations by writing given statements in terms of logical operators [6]
 i) If x is not a real number, then x is not a rational number and not an irrational number. [6]
 ii) All equilateral triangles are isosceles. [4]
3. i) Let f be a homomorphism from a group G_1 to a group G_2 . If H_1 is a subgroup of G_1 and $H_2 = f(H_1)$, then prove that H_2 is a subgroup of G_2 . [5]
 ii) In a group G , $(ab)^i = a^i b^i$ for $a, b \in G$, and any three consecutive positive integers i , then show that G is abelian. [5]
4. An encoding function $e: B^3 \rightarrow B^6$ is given by the generator matrix [10]

$$\begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$
 i) Determine all code words generated by the matrix.
 ii) Find the associated parity check matrix H .
5. i) There are 50 students in each of the senior and junior sections. Each section has 25 male and 25 female students. In how many ways can eight students committee be formed, so that there are four females and three juniors in the committee. [6]
 ii) Find the least number of ways of choosing three different numbers from 1 to 10 so that all choices have the same sum. [4]
- 6.a) i) Define a lattice and show that set of all divisors of 70 forms a lattice using Hasse diagram. [4]
 ii) If $\langle L, \leq \rangle$ is a lattice, then prove that $x^*(y \oplus z) = (x^*y) \oplus (x^*z) \Leftrightarrow x \oplus (y^*z) = (x \oplus y)^*(x \oplus z)$ for all x, y, z in the lattice L . [6]

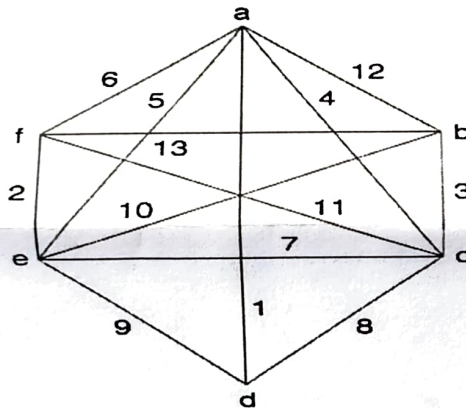
OR

- 6.b) In any Boolean Algebra, prove that [10]
 i) $a = b \Leftrightarrow ab' + a'b = 0$
 ii) $(a + b)(a' + c) = ac + a'b = ac + a'b + bc$.

7. i) Explain in detail about the complements of complete graph K_n on ' n ' vertices and complete bipartite graph $K_{m,n}$. [10]
 ii) Show that the complete bipartite graphs $K_{2,2}$, $K_{2,3}$, $K_{2,4}$ are planar.
8. Define isomorphism between graphs and verify whether the following graphs G and G' are isomorphic [10]

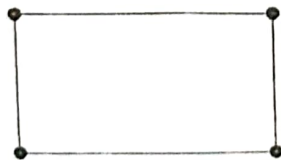


- 9.a) i) Prove that every tree has either one or two centers. [4]
 ii) Find the minimum and maximum cost of travel in the following aero routes between distinct cities by using Prim's Algorithm. [6]



OR

- 9.b) There are eight persons P1, P2, ... P8 standing in in-order queue at reservation counter of a railway station. Draw a ordered rooted tree using above order with P5 as root and then find who will get first and last tickets in pre-order and post order traversals. [10]
10. i) Prove that every tree with two or more vertices is 2-chromatic and check whether the converse is true. [10]
 ii) Determine the chromatic polynomial for the graph given below.



↔↔↔Z/K/TX↔↔↔