

**FACULTY OF ENGINEERING**

B.E. 2/4 (CSE) I - Semester (Old) Examination, December 2011

Subject : **Discrete Structures**

Time : 3 Hours

Max. Marks: 75

**Note:** Answer **all** questions of Part – A. Answer any **five** questions from Part-B.**PART – A (25 Marks)**

1. Define the Law of Duality. Write the Dual for  $(p \wedge \neg q) \wedge (r \wedge \neg q)$ . (2)
2. Define the Rule of Universal Specialization. Give one example. (2)
3. If  $A = \{w, x, y\}$  and  $B = \{1, 2, 3\}$ . Then find the number of Surjective functions from A to B. (2)
4. Define the principle of Inclusion and Exclusion. (2)
5. Solve the Recurrence Relation  $F_{n+2} = F_{n+1} + F_n$  where  $n \geq 0$  and  $f_0 = 0$  ;  $f_1 = 1$ . (3)
6. Write the generating sequence for exponential generating function  $(e^x + e^{-x})$ . (3)
7. Define Group monomorphism. (2)
8. Define and write the properties of Abelian group. (3)
9. What is a complete graph? Give an example for  $n = 6$ . (3)
10. Define Hamiltonian cycle with example. (3)

**PART – B (50 Marks)**

- 11.(a) Show that  $[(p \vee q) \rightarrow r] \leftrightarrow [\neg r \rightarrow \neg(p \vee q)]$  is tautology. (5)
- (b) Prove the following using the rule of Inference. (5)

$$\begin{array}{l} p \rightarrow (q \rightarrow r) \\ \neg q \rightarrow \neg p \\ p \\ \hline \end{array}$$

 $\therefore r$ 

- 12.(a) Prove that  $1^2 + 2^2 + 3^2 + \dots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{2}$  using mathematical induction. (6)

- (b)  $f : Z \times Z \rightarrow Z$  ; by  $f(a, b) = a + b - 3ab$ . Verify the function  $f$  is commutative / Associative both. (4)

- 13.(a) Find the total number of Derrangement for 1, 2, 3, 4, 5, 6? (4)
- (b) Let  $A = \{1, 2, 3, 4, 5\} \times \{1, 2, 3, 4, 5\}$  and  $R$  is defined on  $A$  by  $(x_1, y_1) R (x_2, y_2)$  if  $x_1 + y_1 = x_2 + y_2$ . Verify that  $R$  is an equivalence Relation on  $A$ ?

- 14.(a) Write and explain the properties of Abelian group. (5)
- (b) Prove that  $\langle Q^+, * \rangle$  where  $*$  is a binary operation defined by  $a * b = ab/5$  is a group? (5)

- 15.(a) Write a short note on group code and its Applications. (4)
- (b) Solve the Recurrence Relation  $a_n - 7a_{n-1} + 10a_{n-2} = 0$  for  $n \geq 2$  with initial conditions  $a_0 = 10$  ;  $a_1 = 41$ .

- 16.(a) Find the co-efficient of  $x^{10}$  in  $(1 - 4x)^{-3}$ . (5)
- (b) What is the chromatic number of a complete Bipartite graph with 5 vertices in one partition and 3 vertices in another partition? (5)

- 17.(a) Draw and explain BFS and DFS algorithms for following graph. (5)

