Code No. 3292

FACULTY OF ENGINEERING

B.E. 2/4 (CSE) First Semester (Suppl.) Examination, June/July 2011

DISCRETE STRUCTURES

Time : Three Hours] [Maximum Marks : 75

Note :— Answer **ALL** questions from Part A. Answer any **FIVE** questions from Part B.

PART—A (Marks : 25)

1. Define Converse, Contrapositive and Inverse of an Implication. 3
2. Define Quantifiers. 2
3. What is partial order relation ? 2
4. What is pigeonhole principle ? 2
5. Define semigroups and monoids. 3
6. What is inhomogeneous recurrence relation ? 2
7. What is complete Bipartite graph ? 3
8. What is algebraic system ? 2
9. What is composition of functions ? 3
10. Find chromatic number of a wheel graph. 3

PART—B (Marks : 50)

11. (a) Show that $P \to (Q \to P) \Leftrightarrow \neg P \to (P \to Q)$. 4

    (b) Show that $Q \vee (P \wedge \neg Q) \wedge (\neg P \wedge \neg Q)$ is a tautology. 6

12. (a) On the set Z, define the relation R by aRb if and only if $ab \geq 0$. Prove that R is reflexive and symmetric, but not transitive. 5

    (b) Consider the functions f and g defined by $f(x) = x^3$, $g(x) = x^2 + 1$, $\forall\ x \in R$. Find $g \circ f$, $f \circ g$, f^2 and g^2. 5

13. (a) State and explain the properties of the pigeonhole principle. 5

(b) Find the number of derangements of the integers from 1 to 10 inclusive, satisfying the condition that the set of elements in a first-5 places, is :

(i) 1, 2, 3, 4, 5 in some order

(ii) 6, 7, 8, 9, 10 in some order. 5

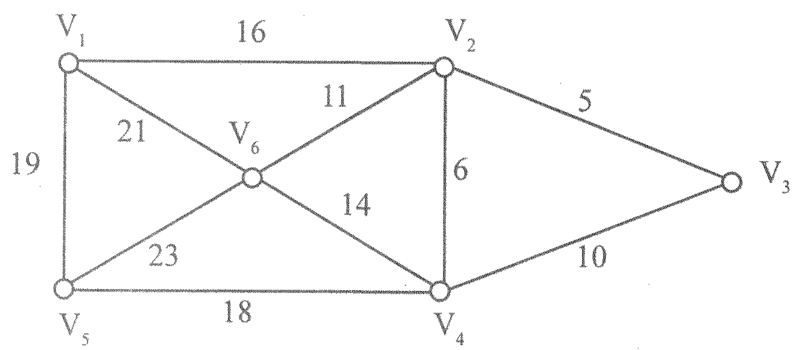
14. (a) Solve the recurrence relation $a_r = 3a_{r-1} + 2$, $r \geq 1$, $a_0 = 1$ using generating function. 5

(b) Solve the recurrence relation $a_n - 9a_{n-1} + 26a_{n-2} - 24a_{n-3} = 0$ for $n \geq 3$ with $a_0 = 0$, $a_1 = 1$, $a_2 = 10$. 5

15. (a) If G is a group such that $(ab)^m = a^m b^m$ for three consecutive integers m for all a, b $\in$ G, show that G is abelian. 5

(b) Let G be a group and H a subgroup of G. Let f be an automorphism of G and $f(H) = \{f(h) \mid h \in H\}$. Prove that f(H) is a subgroup of G. 5

16. (a) Use Kruskal's algorithm to find minimum spanning tree : 6



(b) Define the following graphs with an example each :

(i) Complement graph

(ii) Subgraph

(iii) Spanning subgraph. 4

17. (a) Prove that a complete graph K_n is planar iff $n \leq 4$. 5

(b) Write a brief note about the basic rules for constructing Hamiltonian cycles. 5