b. How many different Hamiltonian cycles are there in K_n, a complete graph on n vertices? 7M

(or)

8\. a. What does Rule 7 indicate about the chromatic number of 7M
i) $K_{3,3}$ ii) $K_{4,4}$ iii) $K_{n,n}$
Determine each chromatic number.

b. Prove that every simple planar graph is 5 – colorable. 8M

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CS/IT 3003

II/IV B.Tech. DEGREE EXAMINATION, JUNE, 2012

Third Semester

DISCRETE MATHEMATICAL STRUCTURES

Time : 3 hours *Max. Marks : 70*

Part-A is compulsory

Answer One Question from each Unit of Part-B

PART-A

10 x 1 = 10M

a. Define quantifier.

b. Define propositional function.

c. In how many ways can five children arrange themselves in a ring ?

d. Define sum rule for basic counting principles.

e. Define digraph.

f. State Pigeon hole principle.

g. Define Poset.

h. Define Lattice.

i. Define Subgraph.

j. Define Adjacency matrix.

PART-B

4 x 15 = 60M

UNIT-I

1. a. Verify that the proposition $\{[p \to (q \vee r)] \wedge (\neg q)\} \to (p \to r)$ is Tautology. **8M**

   b. Show that the R v S follows logically from **7M**

   $C \vee D$, $(C \vee D) \to \neg H$, $\neg H \to (A \wedge \neg B)$, $(A \wedge \neg B) \to R \vee S$

(or)

2. a. Write the negations of the following sentences by changing quantifiers.

   i) There is an integer x such that x is even and x is prime

   ii) Every complete bipartite graph is not planar **8M**

   b. Find PCNF and PDNF for $(P \to (Q \wedge R)) \wedge (\neg P \to (\neg Q \wedge \neg R))$ **7M**

UNIT-II

3. a. How many 5 – letter words are there where the first & last letters

   i) are consonants?

   ii) are vowels and the middle letters are consonants? **8M**

   b. A man has 15 close friends of whom 6 are women. **7M**

   i) In how many ways can he invite three or more of his friends to a party?

   ii) In how many ways can he invite three or more of his friends if he wants the same number of men (including himself) as women?

(or)

4. a. Find the co-efficient of X^{16} in $(1 + X^4 + X^8)^{10}$. **8M**

   b. Solve the following inhomogeneous recurrence relation **7M**
   $a_n - a_{n-1} = 3(n-1)$. For $n \geq 1$, given that $a_0 = 2$.

UNIT-III

5. a. Prove that if R is a transitive and irreflexive relation on a set A, then R is antisymmetric and asymmetric. **7M**

   b. Prove the relation $Q = \{(f, g) \mid f : N \to R, g : N \to R, f \text{ is in } O(g)\}$ is reflexive and transitive, but is not a partial ordering or an equivalence relation. **8M**

(or)

6. a. Suppose R is an arbitrary transitive reflexive relation on a set A. Prove that the relation E defined by x E y, iff x R y and y R x is an equivalence relation on A. **8M**

   b. Find the transitive closure of R is **7M**
   R = { (a, b), (a, c), (c, c), (c, d), (d, c), (c, e), (e, f), (f, d)}

UNIT-IV

7. a. Draw a planar representation of each graph in the following figure if possible. **8M**