D 20626-A (Pages : 2) Name...............................

Reg. No...............................

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, OCTOBER 2011

CS/IT 09 304/PTCS 09 303—DISCRETE COMPUTATIONAL STRUCTURES

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Explain contrapositive.
2. Explain equivalence relation.
3. Explain inverse functions.
4. Define Hamming code.
5. Solve following recurrence relations. Assume n is even :

   $T(n) = T(n-2) + 1, T(0) = 1.$

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Prove that $-(p \wedge q) \Leftrightarrow -p \vee -q$.
7. Find the number of functions from m-element set to an n-element set.
8. Draw the Hasse diagram for the poset (A, (subset)), where A denotes the power set of set (a, b, c).
9. Prove that G is a abelian group if and only if $(a \cdot b)^2 = a^2 \cdot b^2$ for all $a, b \in G$.
10. Show that $Z_7 = \{(1, 2, 3, 4, 5, 6), * \bmod 7\}$ is cyclic group.
11. Solve $f(n) = f(n-1)$; $f(0) = 1$.

(4 × 5 = 20 marks)

Part C

Answer section (a) **or** *section (b).*

12. (a) Show that any proposition can be transformed into CNF.

Or

(b) Find disjunctive normal form of the following formula :

$$(P \wedge Q) \vee (7P \wedge Q) \vee (Q \wedge R).$$

Turn over

13. (a) (i) Find the number of symmetric relations that can be defined on a set with n elements.

(ii) Using adjacency matrix, find the number of different reflexive relation on set A with n-element.

Or

(b) (i) $f : X \to Y$

(1) How many different functions are possible ?

(2) How many diffrent one to one functions are possible ?

(ii) Define equivalence class. Find all equivalence classes of the congruence relation mod 5 on the sets of integer.

14. (a) Let S be the set of real numbers except – 1. Define * on S by $a * B = a + b + ab$. Shw that (S, *) is abelian group.

Or

(b) Let G be the set of all 2 * 2 matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$, where a, b, c, d are real numbers, such that $(ad - bc) \neq 0$. Show that set G with matrix multiplication binary operation forms the group.

Let $H = \begin{pmatrix} a & b \\ 0 & d \end{pmatrix}$ be the set of 2 * 2 matrix where a, b, d are real numbers, such that $ad \neq 0$.

Prove that H is a subgroup of G.

15. (a) Using generating function, solve $f(n) = f(n-1) + f(n-2); f(0) = 1, f(1) = 1.$

Or

(b) Solve $f(n) - 5f(n-1) - 6f(n-2) = 2^n + n.$

(4 × 10 = 40 marks)