**D 70386** (Pages : 2)

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# THIRD SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2014

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

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.*
*Each question carries* 5 *marks.*

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 the set (a,b,c).
9. Prove that G is a abelian group if and only if $(a.b)^2 = a^2.b^2$ for all $a,b \in$ G.
10. Show that $Z_7 = \{(1,2,3,4,5,6), * \text{ mod } 7\}$ is cyclic group.
11. Solve $f(n) = f(n\text{-}1)$ ; $f(0) = 1$.

(4 × 5 = 20 marks)

### Part C

*Answer section (a)* **or** *section (b) of each question.*

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

*Or*

Turn over

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

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

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 a set A with $n$-element.

*Or*

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

(1) How many different functions are possible ?

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

(ii) Define equivalence class. Find all equivalence classes of a 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 $a*B = a + b + ab$. Show 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 $(ad\text{-}bc) \neq 0$. 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 $a, b, c, d$ 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)