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B. TECH.

THEORY EXAMINATION (SEM–VIII) 2016-17

DISCRETE MATHEMATICS

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION – A

1. Attempt all parts of the following question: 10 x 2 = 20

a) What is the difference in relation and function?

b) Define equivalence relation.

c) Transform following statement into symbolic form: Jack and Jill went up the hill.

d) Define negation.

e) Find the permutations of the set $A = \{1, 2, 3, 4\}$ taking two at a time.

f) There are 10 different people at a party. How many ways are there to pair them up into a collection of 5 parings ?

g) Show that $(I, +)$ is an abelian group.

h) Define cyclic group.

i) Define Hamiltonian Path.

j) Define Chromatic number.

SECTION – B

2. Attempt any five parts of the following questions: 5 x 10 = 50

a) Let R be the relation on the set A of integers, defined by xRy if $x - y$ is divisible by 4. Show that R is an equivalence relation, and describe the equivalence classes.

b) Show the implication

(i) $(P \vee \neg P) \to Q \to (P \vee \neg P) \to R \Rightarrow (Q \to R)$

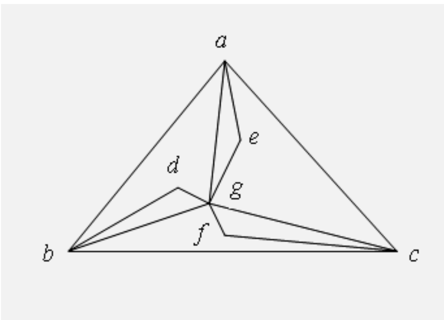
(ii) $(P \to Q) \to Q \Rightarrow P \vee Q$

c) (c) Find the solution of recurrence relation $a_n = 6a_{n-1} + 11a_{n-2} - 6a_{n-3}$ with condition $a_0 = 2, a_1 = 5$ and $a_2 = 15$

d) Show that $(F, +, .)$ is a field where F is a set of all rational numbers and $+$ and $.$ are ordinary addition and multiplication operators.

e) Show that number of odd degree vertices is always even.

f) Show that the graph shown in figure does not contain Hamiltonian Circuit.



g) Let G be a group; for fixed element G, let $G_x = \{a \in G : ax = xa\}$ show that G_x is a subgroup of G for all $x \in G$.

h) Determine the generating function of the numeric function a_r where (i) $a_r = 3^r + 4^{r+1}, r > 0$ (ii) $a_r = 5, r \geq 0$

SECTION – C

Attempt any two parts of the following questions: **2 x 15 = 30**

3. (i) Show that $A \cup (\bar{B} \cap C) = (A \cup \bar{B}) \cap (A \cup C)$ Using Vein Diagram.

(ii) Show that whether the relation $(x, y) \in R$, if $x \geq y$ defined on the set of positive integer is partial order relation.

4. (i) Consider an algebraic system $(G, *)$ where G is the set of all all non-zero real numbers and $*$ is a binary operation defined by $a * b = \frac{ab}{4}$ show that $(G, *)$ is and abelian group.

(ii) Prove that if H_1 and H_2 are two subgroups of G, then $H_1 \cap H_2$ is also a subgroup.

5. (i) State and prove Hand Shaking LemmSa.

(ii) Show that maximum number of edges in a simple graph with n vertices is $\frac{n(n-1)}{2}$