

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**

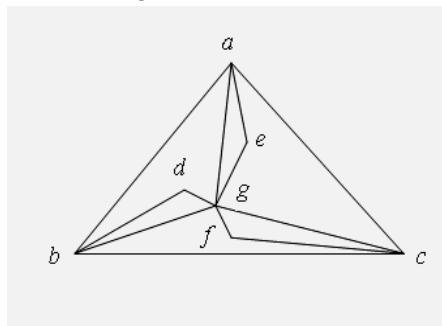
1. Attempt all parts of the following question: **10 x 2 = 20**

- 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) $(P \vee \neg P) \rightarrow Q \rightarrow (P \vee \neg P) \rightarrow R \Rightarrow (Q \rightarrow R)$
 - (ii) $(P \rightarrow Q) \rightarrow Q \Rightarrow P \vee Q$
- 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 $(F, +, \cdot)$ is a field where F is a set of all rational numbers and $+$ and \cdot 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) $a_r = 3^r + 4^{r+1}, r \geq 0$ (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 $\frac{n(n-1)}{2}$