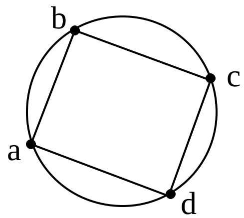
(c) Give two subgraphs with three vertices for the graph shown below :



5

(d) Let $A = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}\}$ and let $T = \{(v_2, v_3), (v_2, v_1), (v_4, v_5), (v_4, v_6), (v_5, v_8), (v_6, v_7), (v_4, v_2), (v_7, v_9), (v_7, v_{10})\}$.

Show that T is a rooted tree and identify the root. 5

5. (a) Define :

(i) Power set

(ii) Symmetric difference. 2½

(b) Using mathematical induction, prove $1 + 2^n < 3^n$ for $n \geq 2$. 2½

(c) Let G be the set of all non-zero real numbers and let $a \times b = \frac{ab}{2}$, show that (G, *) be an abelian group. 2½

(d) Define :

(i) Graph

(ii) Connected graph. 2½

TKN/KS/16/6006

Bachelor of Science (B.Sc.) (I.T.) Semester—II (C.B.S.) Examination

APPLIED MATHEMATICS—II

Paper—VI

Time : Three Hours] [Maximum Marks : 50

Note :— (1) **ALL** questions are compulsory and carry equal marks.

(2) Draw neat and labelled diagrams wherever necessary.

EITHER

1. (a) Define the matrix of a relation. Draw a graph for $A = \{a_1, a_2, a_3\}$, $B = \{b_1, b_2, b_3, b_4\}$ and $R = \{(a_1, b_1), (a_1, b_4), (a_2, b_2), (a_2, b_3), (a_3, b_1)\}$. 5

(b) Define symmetric difference of sets. Find the symmetric difference from sets A = {a, b, c, d} and B = {a, c, e, f, g}. 5

OR

(c) Draw Venn diagram for following :

(i) $A \cup B \cup C$

(ii) $A \cap B \cap C$

(iii) $B - A$. 5

(d) Let $A = Z^+$, the set of positive integers, and let $R = \{(a, b) \in A \times A \mid a \text{ divides } b\}$

Is R symmetric, asymmetric, or antisymmetric ? 5

EITHER

2. (a) Write and prove the Pigeonhole principles. 5

(b) Define invertible function :

Let f be the function $f : A \rightarrow B$ then prove that f^{-1} is a function from B to A if and only if f is one to one. 5

OR

(c) Find an explicit formula for the sequence defined by $C_n = 3 C_{n-1} - 2 C_{n-2}$ with initial conditions $C_1 = 5$ and $C_2 = 3$. 5

(d) Show by mathematical induction, for all $n \geq 1$,

$$1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}.$$ 5

EITHER

3. (a) If $(L_1, \leq)$ and $(L_2, \leq)$ are lattices, then $(L, \leq)$ is a lattice, where $L = L_1 \times L_2$ and the partial order $\leq$ of L is the product partial order. 5

(b) Show that the binary operation * on A {a, b, c, d} is commutative for :

*	a	b	c	d
a	a	c	b	d
b	c	d	b	a
c	b	b	a	c
d	d	a	c	d

5

OR

(c) Prove that each element a in group G has only one inverse in G. 5

(d) Let $(G, *)$ and $(G^1, *^1)$ be two groups and let $f : G \rightarrow G^1$ be a homomorphism from G to G^1 then show that :

If e is the identity in G and e^1 is the identity in G^1 then $f(e) = e^1$. 5

EITHER

4. (a) What is spanning trees of connected relations ? Discuss. 5

(b) If a graph G has more than two vertices of odd degree then prove that there can be no Euler path in G. 5

OR