NOTE

* ALL questions are compulsory

* Right Indicates full Marks .

Q.1) Attempt (Any Three) of the following

(15)

a) Evaluate Transitive Closure cells with the help of Warshall's Algorithm if

$$M_R = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$$

b) Prove by Mathematical Induction $1^3 + 2^3 + 3^3 \pm ----- \mp n^3 = \frac{n^2(n+1)^2 + 4}{4}$

c) Find number of integers between 1 and 2100 that are divisible by 2 ,3 and 7 .

d) Evaluate M_R, M_S $R \cup S$, $R \cap S$, $(R \cup S)^c$, $(R \cap S)^c$. R^c . S^c , R^{-1}, S^{-1} , Indegree of R and S ,

Outdegree of R and S , RoR ,SoS ,SoR ,RoS , Digraph of R and S if

R = {(1 1) (1 3) (1 4) (2 2) (2 5) (3 1) (3 3) (4 1) (4 3) (4 4) (5 1) (5 3) (5 5) } and

S = {(1 2) (1 3) (1 5) (2 3) (2 4) (2 5) (3 1) (3 2) (3 3) (3 5) (4 2) (4 4) (5 1) (5 2) (5 3) (5 4) }

e) Define − 1) Poset 2) Partially ordered Relation , Draw the Hasse's Digraph With the help of matrix

Here A = {1 ,2, 3, 4,5 } $M_R = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

f) Check whether the given equation is an equivalance relation if $a \equiv b (mod\ m), if\ m\ divides\ a - b$

Q .2) Attempt (Any Three) of the following

(15)

a) Let $f : R \rightarrow R$ Be defined by $f(x) = 7x - 5$ prove that it is a bijective function also evaluate the formula for inverse function .

b) Let f ,g and h are the function from R to R defined as $f(x) = 2x^3 - 7$, $g(x) = 4x^2$, $h(x) = 5x + 4$ Find a) ((gof)oh)(1)   b) ((fof)og)(2)
c) (hog)og)(1) d) (hoh)oh (-2) e) (hof)og)(-2)

c) Define − 1) Logarithmic function 2) Exponential function 3) Ceiling function 4) Flooring function

5) Chebyshev's Inequality .

d) Two cards are drawn froma pack of cards Find the probability that 1) Both are hearts

2) One is heart and the other is a spade .

e) Find Mean and Variance for the following probability distribution

X	0	1	2	3
r	0.3	0.4	0.2	0.1

f) For the following probability distribution .

x	1	2	3	4	5	6
P(x)	2/10	3/10	1/10	1/10	2/10	1/10

Find i) $P(x > 4)$ ii) $P(X \le 3)$ iii) $p(2 < x < 5)$

(15)

Q .3) Attempt (Any Three) of the following

a) From 4 professor and 8 students a committee of 3 is to be formed .In how many ways this can be done if the committee contains
   1) Exactly one professor 2) at most one professor 3) at least 2 professor

b) Find the number of distinct permutation of the letters of the word QUALIFICATION .

c) 20 Different books are to be arranged on a shelf . Find the number of ways in which this can be done if two specified books are 1) Always together 2) Never together

d) i)State and prove Pigeonhole Principle ii) There are 38 different time periods during which classes at a university can be scheduled If there are 677 diffferent classes ,how many different rooms will be needed .

e) Solve – 1) How many solutions does the equation x+y+z = 14 have where x ,y,z are non-negative integers ,2) In how many ways can 15 balloons be distributed at a Birthday party among 10 children .

f) Evaluate first seven term of R.R. if $a_n = 6a_{n-1} + 5a_{n-2}$ with $a_0 = 1$, $a_1 = 3$.
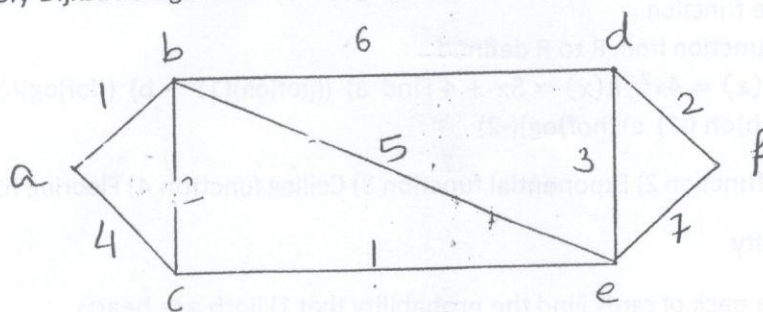
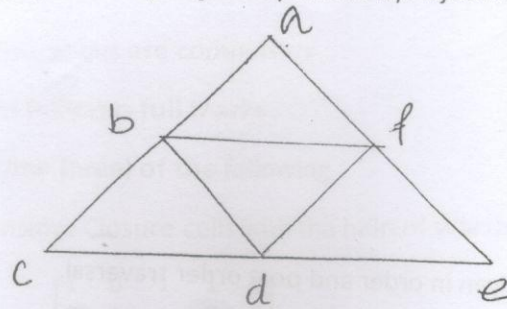- 15 marks

Q. 4 Attempt (Any Three) of the following

a) Define the bipartite graph and check whether following graphs are bipartite graphs
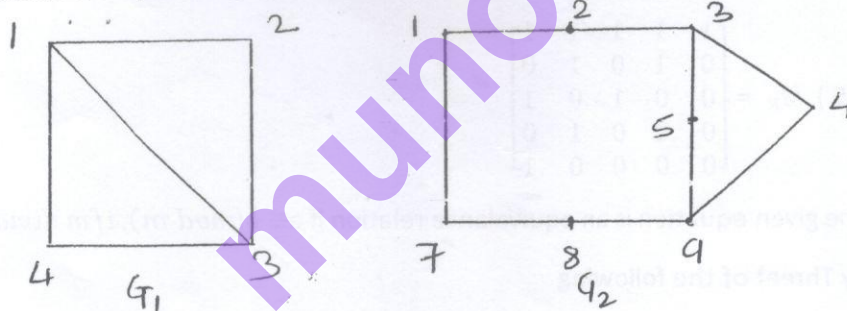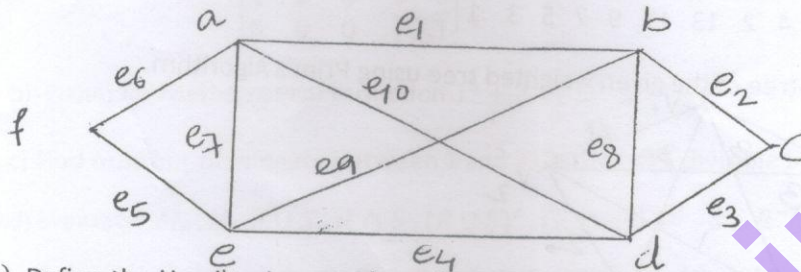

b) Apply Dijkstra's algorithm to the graph given below and find the shortest path from a to f .

c) For the given graph find- a) Adjacency matrix b) Adjacency List c) Verify handshaking theorem
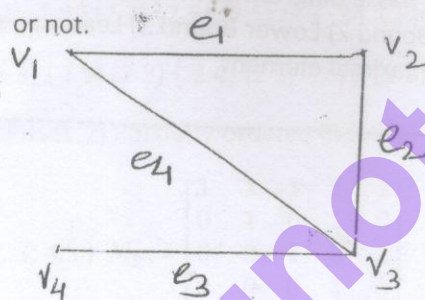

d) Determine whether, the given graph is Eulerian, Semi-Eulerian or Neither Justify

e) Define the Hamiltonian graph ,path ,circuit Check whether the following graph is
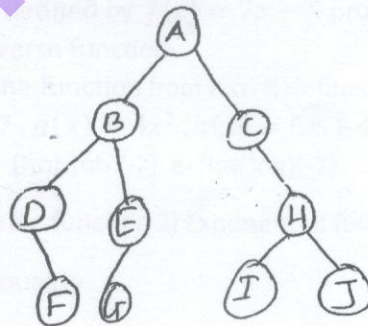
Hamiltonian or not.

f) Explain the following terms. a) Breath first search b) Alpha-Beta pruning

Q.5 Attempt any 3 - 15 marks

a) From the given tree Identify following Right subtree ,Parent ,left child ,Height of tree ,

level of tree

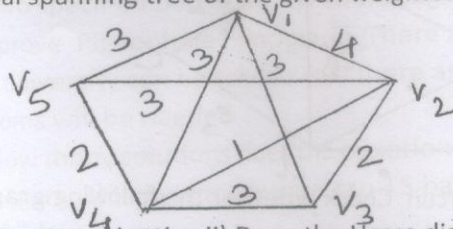b) By Huffman's coding compression technique find the Huffman's tree

for CCAABBBEDDCCAEBDDDCC

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c) Draw the unique binary tree for given in order and post order traversal.

In order: 4 6 10   12 8 2 1 5 7 11 13 7 3

Post Order: 12 10 8 6 4 2 13 11 9 7 5 3 1

d) Find the minimal spanning tree of the given weighted tree using Prim's Algorithm.

e)   Define- i) Poset and Lattice ii) Draw the Hasse diagram of the poset (S_{30}, d).
f)   Define the following terms – 1) Upper Bound 2) Lower Bound 3) Least upper bound 4)
     Greatest lower bound 5) Minimal and maximal element