Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5559]-181

S.E. (Computer) (I Sem.) EXAMINATION, 2019
DISCRETE MATHEMATICS
(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.
(*ii*) Figures to the right indicate full marks.
(*iii*) Your answers will be valued as a whole.
(*iv*) Assume suitable data, if necessary.

Q.1(a) Show that
$7^{2n}+(2^{3n-3})(3^{n-1})$ is divisible by 25 for all natural number n. [3]

(b) Among the integer 1 to 1000: How many of them are not divisible by 3 nor by 5 nor by 7 How many are not divisible by 5 and 7 but divisible by 3 [3]

(c) Let A={1,2,3,4,6,9,12} let aRb if a divided b. Show that R is POSET , Draw Hasse diagram. Prove or disprove if it is a lattice [6]

OR

Q.2 (a) What is multiset. Let P and Q are two multiset defined as P = {a,a,a,c,d,d} and Q= {a,a,b,c,c}. Obtain Union, Intersection and difference of two multisets P and Q. [3]

(b) Prove that the set of rational numbers is countably infinite. [3]

(c) Relation on {1,2,3,4,5}. If relation is defined as
{(1,1),(2,2),(3,3),(4,4),(5,5),(1,5),(5,1),(3,5),(5,3),(1,3),(3,1)}.

Find the equivalence classes [3]

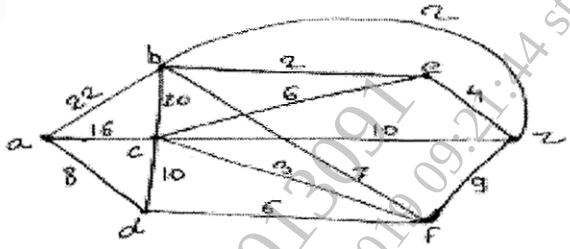
d) Show that the set of all divisors of 70 for divisibility relation forms a lattice [3]

Q.3(a) 2 mathematics papers & 5 other papers are to be arranged at an examination find the total no of ways if, i) Mathematics papers are consecutive. [3]

(b) In the expansion of $(1+x)^6$, what is the coefficient of x^3 [3]

P.T.O.

(c) Use dijkstra's algorithm to find the shortest path between a and z [6]



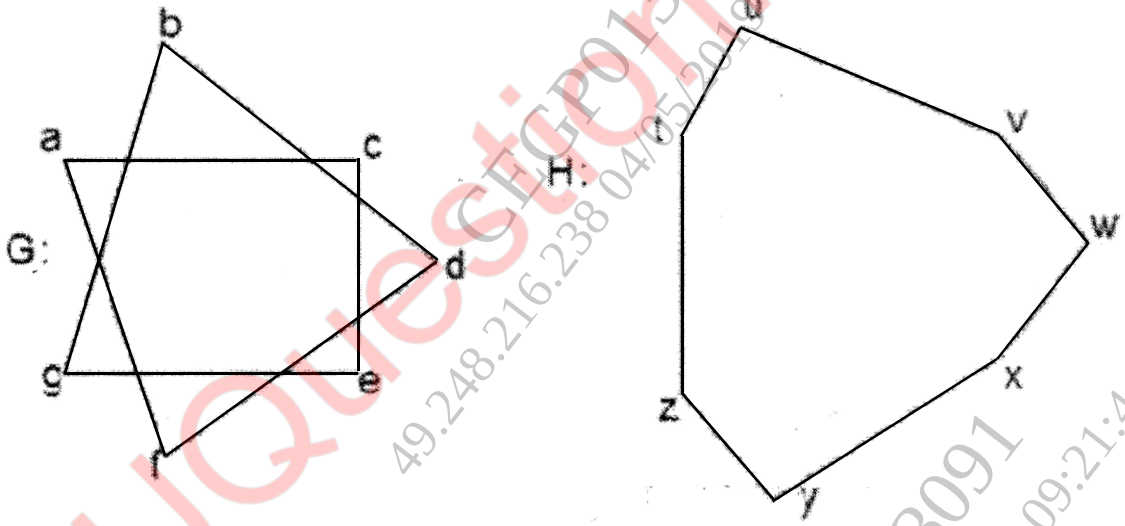
Or

Q.4 (a) If the letters of the word 'REGULATIONS' be arranged at random. What is the chance that there will be exactly 4 letters between R and E? [3]

(b)Use Biomial theorm to expand $(x^4+2)^3$ [3]

c) Under what condition Kmn will have eulerian circuit ? [3]

d) The graphs G and H with vertex sets V(G) and V(H), are drawn below. Determine whether or not G and H drawn below are isomorphic. If they are isomorphic , give a function g: V(G)->V(H) that defines the isomorphism. If they are not explain why they are not. [3]

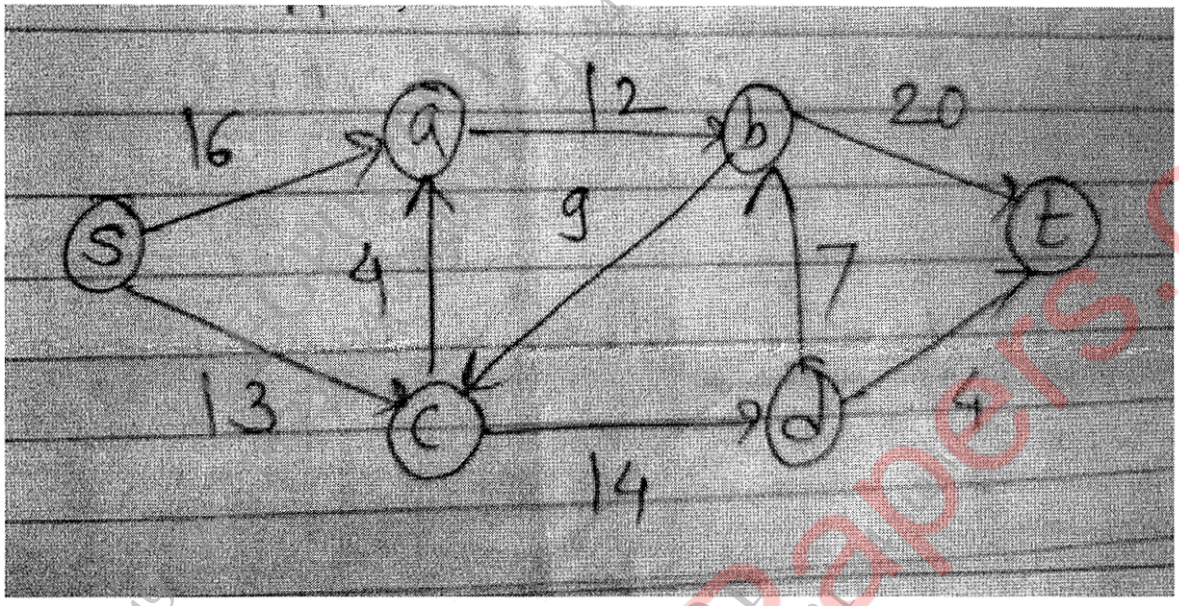


Q.5(a) Suppose data items A,B,C,D,E,F,G occur in the following frequencies.

Data Items	A	B	C	D	E	F	G
Weight	10	30	5	15	20	15	05

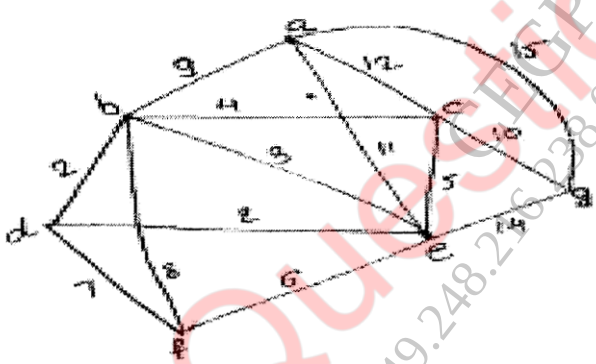
Construct a Huffman code for the data.
What is the minimum weighted path length. [6]

(b) Using the labelling procedure to find maximum flow in the transport network in the following figure. Determine the corresponding minimum cut. [7]



Or

Q.6 (a) Give the stepwise construction of minimum spanning tree using Prims algorithm for the following graph. Obtain the total cost of minimum spanning tree. [7]



(b) Define with example.
i) Level and height of a tree.
ii) Binary search tree.
iii) Spanning tree [6]

Q.7 a) What is Monoid. Show that the algebraic structure (A,+) is a monoid, where A is set of integers and + is a binary operation giving addition of two integers. [3]

b) Define the following terms [3]

i.Ring

ii.Field

iii.Integral domian

c) Show that $R = \{a + b\sqrt{2}; b \in I\}$ for the operation +,* is integral domain but not a field. [7]

Or

Q.8 a) Let A = {0,1} . Is A closed under

1) Multiplication

2) Addition [4]

b) Define [4]

1) Properties of Binary operations

2) Ring with unity

c) Let R = {0,60,120,180,240,300} and * = binary operation so that for a and b in R a * b is overall angular rotation corresponding to successive rotations by a and by b show (R,*) is a group. [5]