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

| Seat No. | |
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# [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]

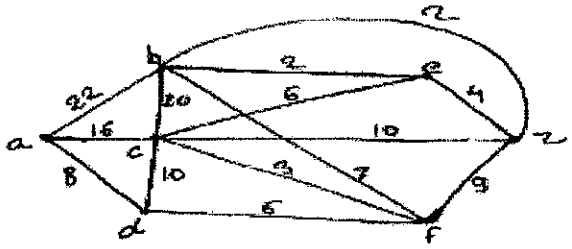
d) Show that the set of all divisors of 70 for divisibility relation forms a lattice [3]

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]



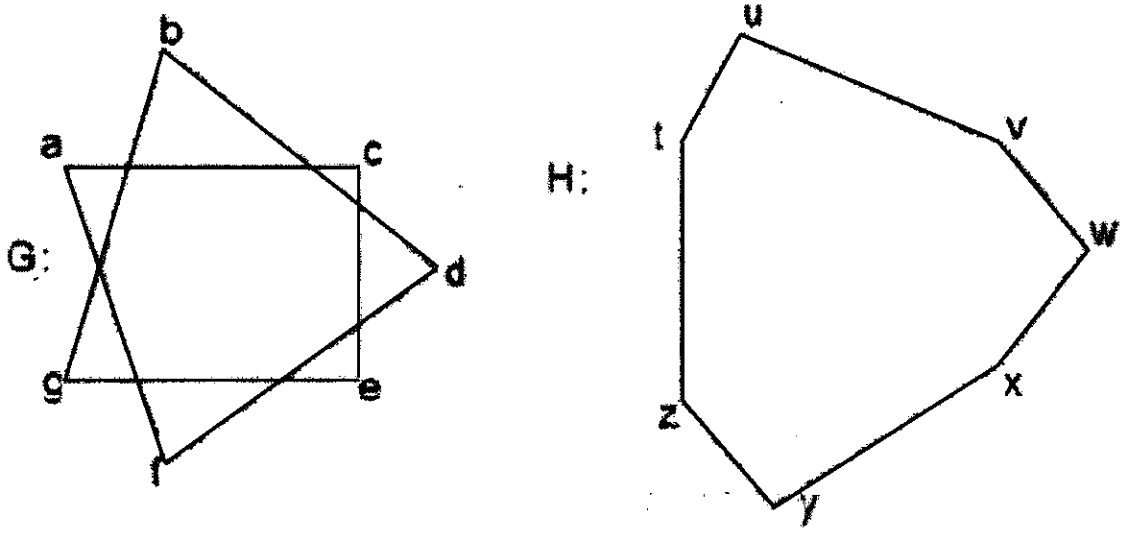

Or

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]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
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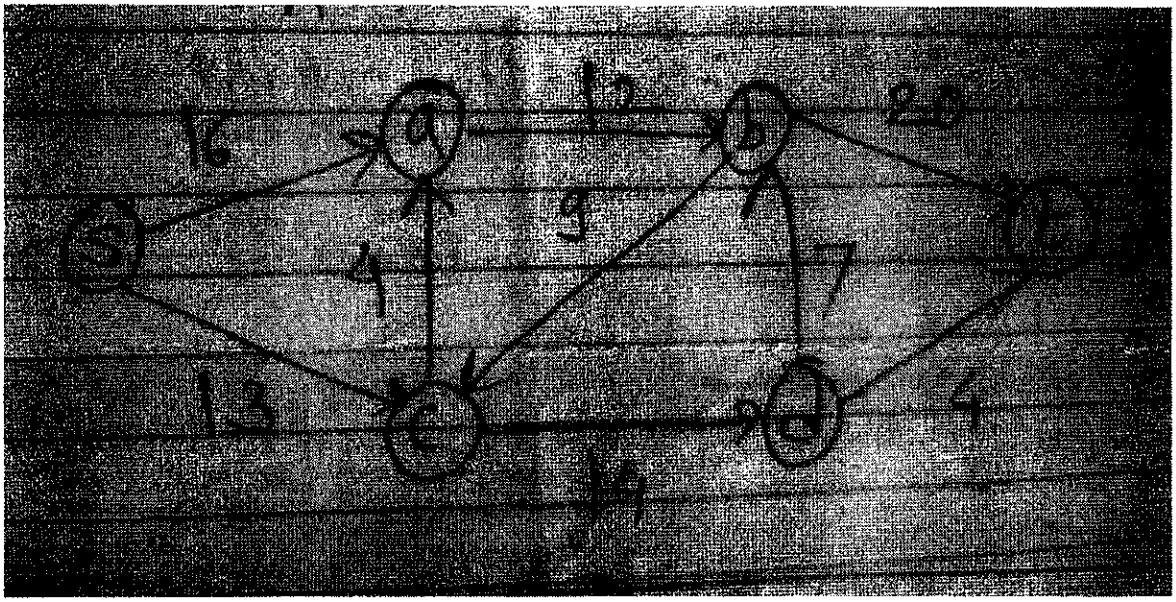
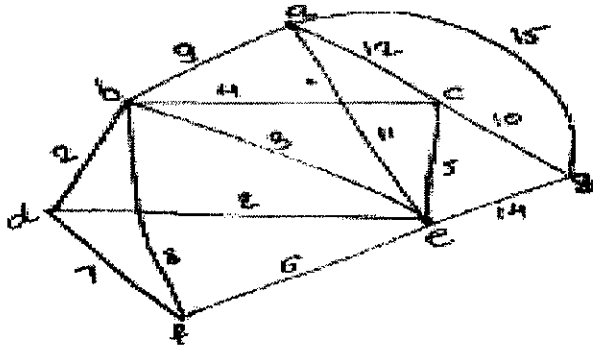


Or

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]

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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]