

SPPU-SE-COMP-CONTENT – KSKA Git

Total No. of Questions—8]

[Total No. of Printed Pages—4

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**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]

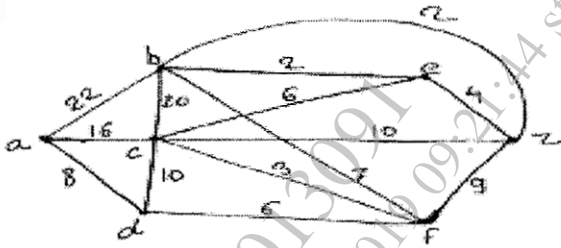
Q.3(a) 2 mathematics papers & 5 other papers are to be arranged at an examination find the total no of ways if, i) Mathematics papers are consecutive. [3]

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

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



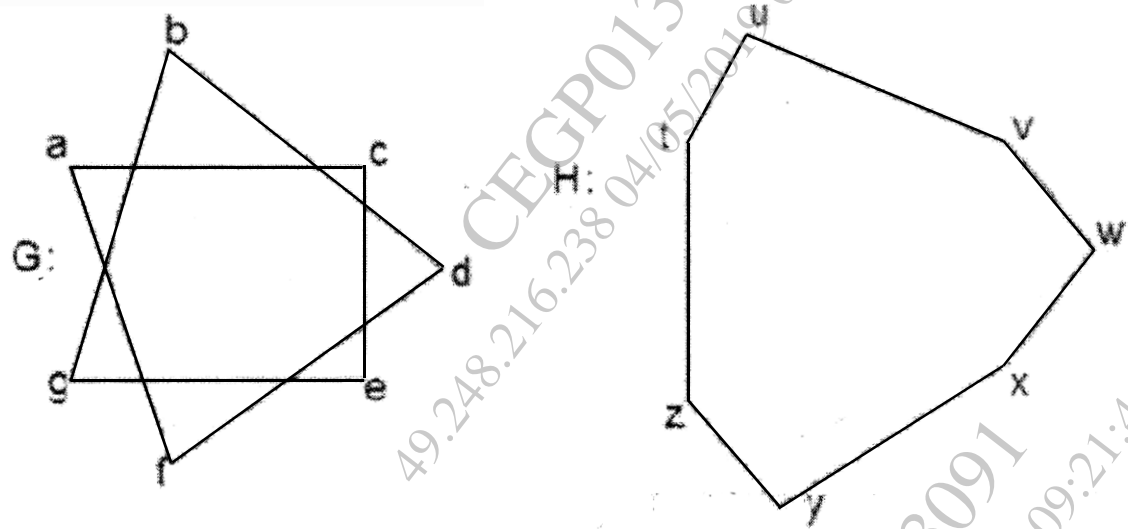
Or

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?

(b) Use Biomial theorem 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 $g: V(G) \rightarrow V(H)$ that defines the isomorphism. If they are not explain why they are not. [3]



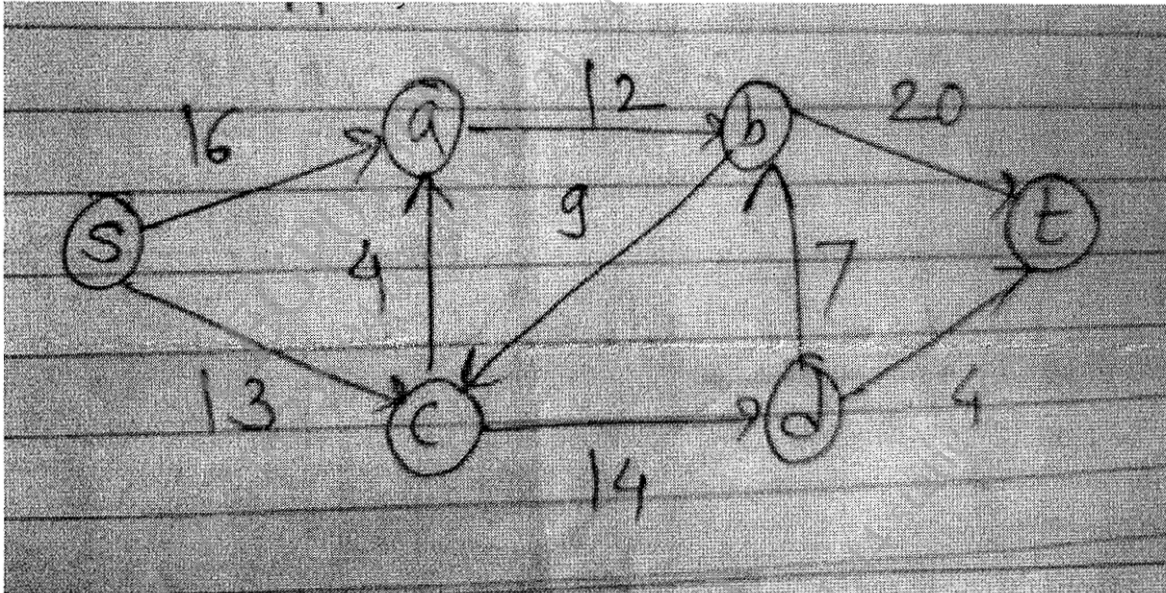
Q.5(a) Suppose data items A,B,C,D,E,F,G occur in the following frequencies.

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]

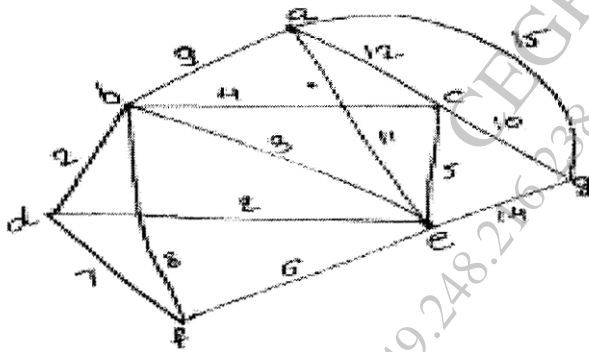
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(b) Using the labelling procedure to find maximum flow in the transport network in the following figure. Determine the corresponding minimum cut. [7]



Or

Q.6 (a) Give the stepwise construction of minimum spanning tree using Prim's 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]

SPPU-SE-COMP-CONTENT – KSKA Git

b) Define the following terms [3]

i. Ring

ii. Field

iii. Integral domain

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

b) Define

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]