

Total No. of Questions: 8]

SEAT No. :

PA-1233

[5925]-255

[Total No. of Pages : 5

S.E. (Computer Engg./Computer Science and Design Engineering/
Artificial Intelligence & Data Science)

DISCRETE MATHEMATICS
(2019 Pattern) (Semester-III) (210241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 Q.7 Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data wherever necessary.

- Q1)** a) The company has 10 members on its board of directors. In how many ways can they elect a president, a vice president, a secretary and treasure. [6]
- b) Find eighth term in the expansion of $(x+y)^{18}$ [6]
- c) A box contains 6 white and 5 black balls. Find number of ways 4 balls can be drawn from the box if [6]
- i) Two must be white
 - ii) All of them must have same colour

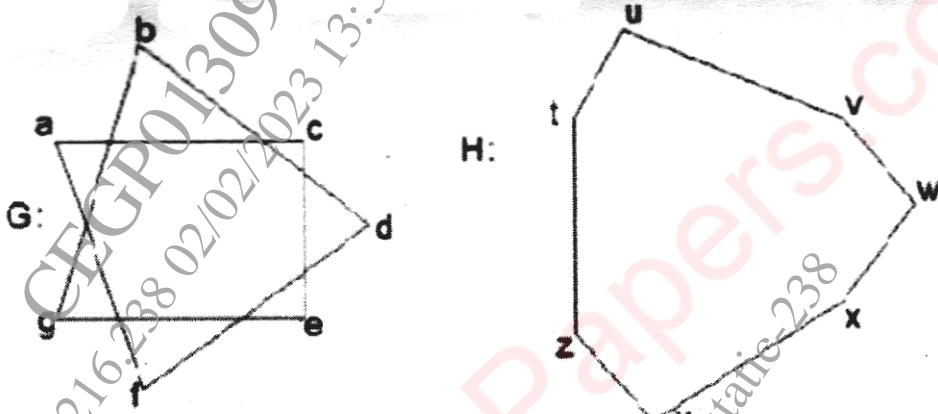
OR

- Q2)** a) In how many ways can word the 'HOLIDAY' be arranged such that the letter I will always come to left of letter L. [6]
- b) In how many ways can one distribute 10 apples among 4 children [6]
- c) Use Binomial theorem to expand $(X^4+2)^3$ [6]

- Q3)** a) Is it possible to draw a simple graph with 4 vertices and 7 edges. Justify? [7]
- b) Define following terms with example. [5]
- i) Complete graph
 - ii) Regular graph
 - iii) Bipartite graph
 - iv) Complete bipartite graph
 - v) Paths and circuits

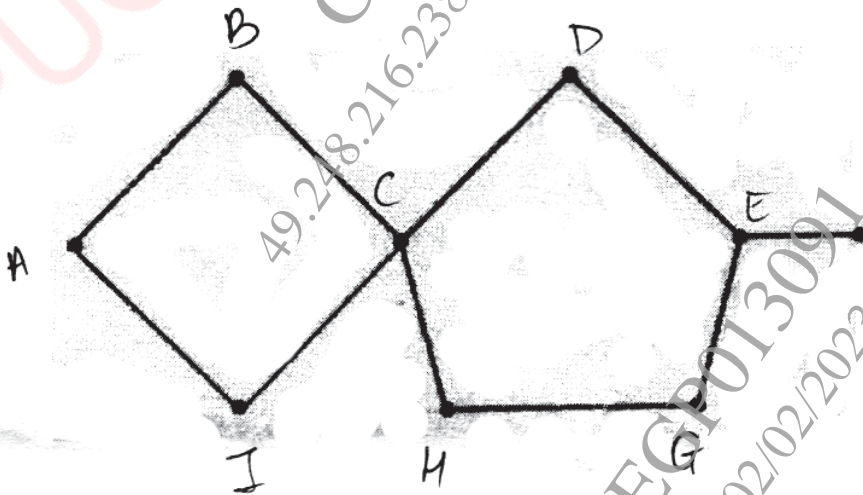
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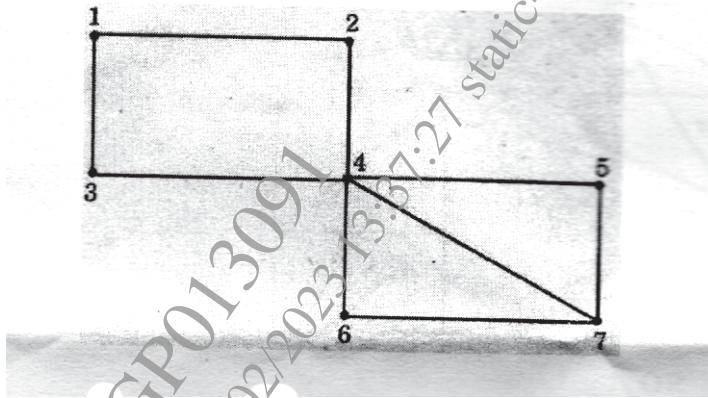
- c) The graphs G and H with vertex sets $V(G)$ and $V(H)$, are drawn below. Determine whether or not G and H drawn below are isomorphic. If they are isomorphic, give a function $g: V(G) \rightarrow V(H)$ that defines the isomorphism. If they are not explain why they are not. [5]



OR

- Q4) a) Determine which if the graph below represents Eulerian circuit, Eulerian path, Hamiltonian circuit and Hamiltonian Path. Justify your answer [7]





- b) A connected planar graph has nine vertices with degree 2,2,2,3,3,3,3,4,5 [5]

Find

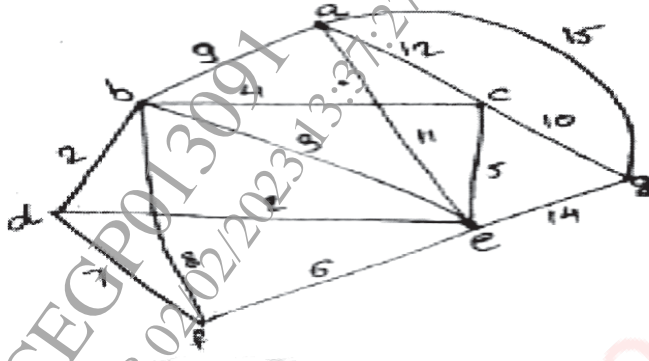
- i) number of edges
 - ii) number of faces
 - iii) construct two such graphs
- c) Explain the following statement with example [5]
 “Every graph with chromatic number 2 is bipartite graph”

Q5) a) Construct Huffman tree. [6]

A	5
B	6
C	6
D	11
E	20

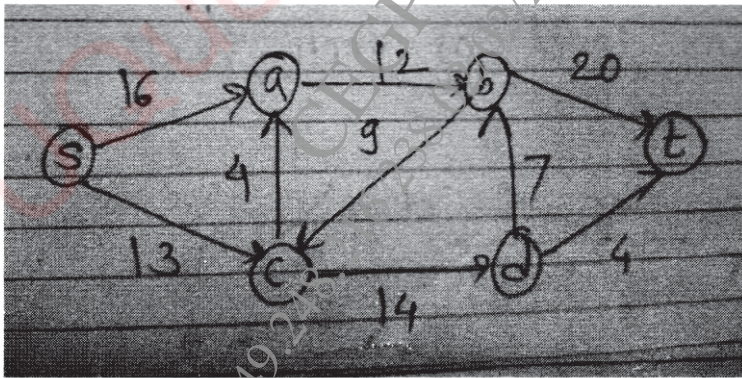
- b) Explain [6]
- i) Cutset
 - ii) Tree properties
 - iii) Prefix code

- c) Give the stepwise construction of minimum spanning tree using Prim's algorithm for the following graph. Obtain the total cost of minimum spanning tree. [6]



OR

- Q6) a) Using the labelling procedure to find maximum flow in the transport network in the following figure. Determine the corresponding minimum cut. [6]



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

- c) Construct binary search tree by inserting integers in order [6]
 50,15,62,5,20,58,91,3,8,37,60,24
 Find
 i) No of internal nodes
 ii) leaf nodes

Q7) a) 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 that $(R, *)$ is a group. [6]

b) Following is the incomplete operation table of 4-element group. Complete the last two rows. [6]

*	e	a	b	c
e	e	a	b	c
a	a	b	c	e
b				
c				

c) Explain Algebraic system and properties of binary operations. [5]

OR

Q8) a) Explain the following terms with examples
 i) Ring with unity
 ii) Integral domain
 iii) Field [6]

b) Consider the set Q of rational numbers and let $a*b$ be the operation defined by $a*b = a + b + ab$ [6]

- i) Find $3*4$
 ii) $2*(-5)$,
 iii) $7*(1/2)$

Is $(Q, *)$ a semigroup? Is it commutative?

c) Show that $(\mathbb{Z}_n \oplus)$ is Abelian group [5]

