[6352]-40

S.E. (Computer Engineering /Artificial Intelligence & Data Science/ Computer Science & Design Engg./Computer Science)
DISCRETE MATHEMATICS
(2019 Pattern) (Semester- III) (210241)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

4) *Assume suitable data, if necessary.*

Q1) a) Suppose repetitions are not possible. **[6]**

     i) How many three digitnumbers can be formed by using the digits 2, 3, 4,5,7,9?

     ii) How many of these numbers are less than 400? How many are even?

b) Find eighth term in the expansion of $(x+y)^{13}$ **[6]**

c) 12 persons are made to sit around a table. Find the number of ways they can sit such that 2 specific persons are not together. **[6]**

OR

*Q2)* a) A student has to answer 10 out of 13 questions in an exam: **[6]**

     i) How many choices have he, if he must answer the first or second question but not both?

     ii) How many choices have he, if he must answer exactly three out of first five questions?

b) Suppose that repetitions are not permitted. In how many ways 4 digitnumbers can be formed from the digits 1, 2, 3, 5, 7, 8? How many such numbers are less than 4000? **[6]**

c) Find the number of ways of arranging the letters of the word TENNESSEE all at a time? Find if the first two letters must be E? **[6]**

P.T.O.

Q3) a) Explain the following: **[6]**

     i) Bipartite graph

     ii) Planar graph

     iii) Eulerian graph

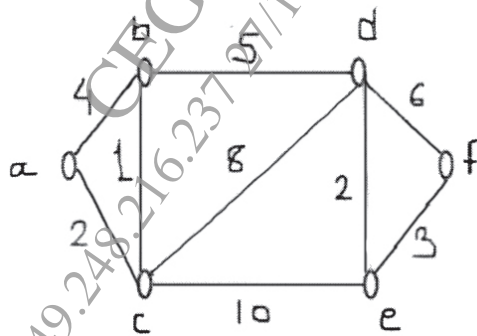b) Whether the following pairs of graphs are isomorphic or not? **[5]**
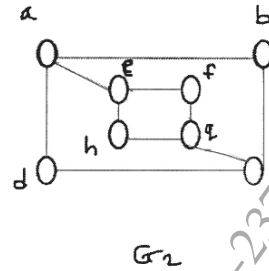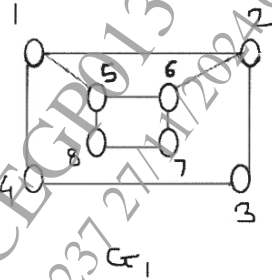
c) Explain the following in brief with example: **[6]**

     i) Adjacency matrix

     ii) Incidency matrix

OR

Q4) a) Use Dijkstra's algorithm to find the shortest path from vertex a to f **[6]**

b) Explain the following : **[6]**

     i) Spanning tree

     ii) Colouring of graph

     iii) Bipartite graph

c) Prove that, If G is connected planar graph with N vertices, E edges and R regions then $N - E + R = 2$ **[5]**

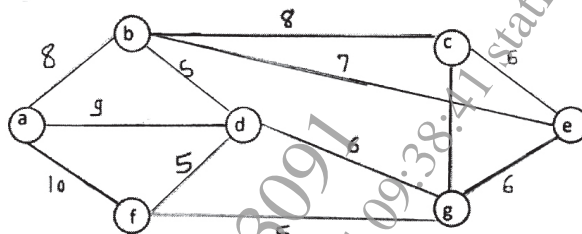**Q5)** a) Define the following terms with example: **[6]**

    i)   Binary tree

    ii)   Ordered tree

    iii)   Eccentricity of vertex

  b) Suppose data items A, B, C, D, E, F, G occur in the following frequencies respectively 8, 22, 9, 11, 13, 10, 15. Construct Huffman code for the data. **[6]**
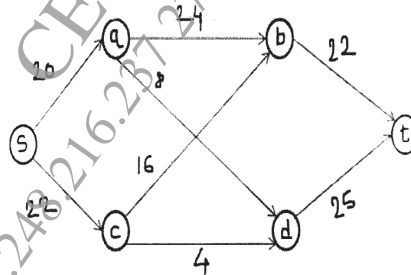
  c) Create a binary search tree generated by inserting integer in order 50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24. **[6]**

<div align="center">OR</div>

Q6) a) Use Prims algorithm to construct a minimal spanning tree starting at vertex a. **[6]**
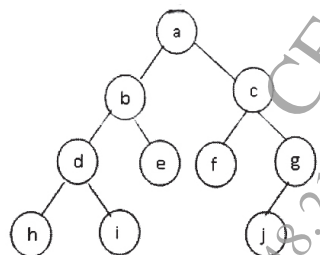

  b) Determine the maximum flow in the transport network given below. Determine the corresponding min cut. **[6]**

  c) Explain the following: **[6]**

    i)   Regular m-ary tree with example.

    ii)   Find the preorder, postorder and inorder of the following binarytree

Q7) a) Explain the following terms giving suitable example: **[6]**

      i)   Monoid

      ii)   Group

      iii)   Cyclic group

   b) Let $(Q,*)$ is an algebraic system. $*$ is a binary operation on Q defined as $a * b = a + b$ for every $a, b \in Q$. Determine whether $(Q,*)$ is group? **[6]**

   c) Show that $S = \left\{ a + b\sqrt{2}; a, b \in Z \right\}$ for the operations + and $*$ is an integral domain. **[5]**

<div align="center">OR</div>

Q8) a) Explain the following terms giving suitable example: **[6]**

      i)   Homomorphism of groups

      ii)   Integral domain

      iii)   Abelian group

   b) Let Z_n denotes the set of integers $\{0, 1, 2, ... n - 1\}$. Let $*$ be a binary operation on Z such that , $a * b =$ the remainder of ab divided by n **[6]**

      i)   Construct the table for $n = 4$

      ii)   Show that $(Zn, *)$ is semigroup for any n.

   c) What is Hamming distance? Find minimum distance generated by paritymatrix H = 110 011   101 100010001

   How many errors can it be detect or correct? **[5]**

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