MEA Engineering College, Perinthalmanna

DEPARTMENT OF MCA

Ist semester - MCA

Course : 20MCA101 - Mathematical Foundations for Computing

CO BL MARK

Smart Question Bank

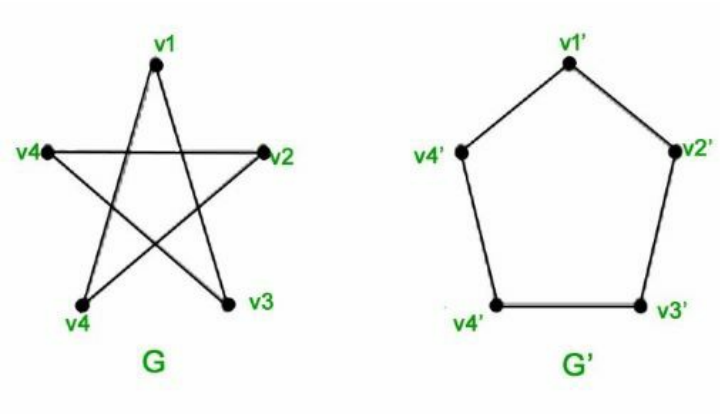
PART A

1. find the number of edges in a graph having 6 vertices each of degree 3 — CO3 3 (3)
2. Define planar and non-planar graph with examples. — CO3 1 (3)
3. show that the sum of degrees of all the vertices is twice the number of edges — CO3 4 (3)
4. Find the rank of the matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$ — CO4 3 (3)
5. Show that the vectors $(1,-1,0)$, $(1,3,-1)$, $(5,3,-2)$ are linearly dependent. — CO4 3 (3)
6. Distinguish between Bipartite and Complete bipartite graph with examples — CO3 1 (3)
7. Define planar and non-planar graph with examples. — CO3 1 (3)
8. Define Hamiltonian cycle and Euler circuit with example — CO3 2 (3)
9. Are the vectors (1,2,1),(2,1,4) and (4,5,6) linearly independent ? justify your answer. — CO4 4 (3)
10. Determine the rank of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 2 & 5 \end{bmatrix}$ — CO4 3 (3)

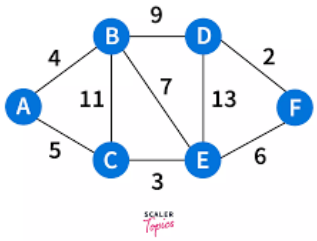
PART B

1. Describe graph isomorphism .check whether the given graphs are isomorphic or not.

CO3 3 (7)



2. Use Dijkstra's algorithm to calculate the shortest path between the vertices A and F in the weighted graph given below — CO3 4 (7)



3. prove that a connected graph G is an Euler graph if all vertices of G are of even degree. CO3 4 (7)

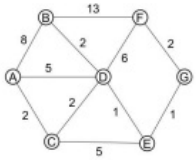
4. Find the eigen values and eigen vectors of $\begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$ CO4 3 (7)

5. Diagonalize the matrix $\begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ CO4 3 (7)

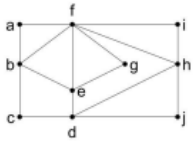
6. Find out what type of conic sections the quadratic form $Q = 17x_1^2 - 30x_1x_2 + 17x_2^2 = 128$ represents and transform it into principal axes form. CO4 3 (7)

7. Find the values of a and b for which the system of equations $x + 2y + 3z = 6, x + 3y + 5y = 9, 2x + 5y + az = b$ has
   1) no solution
   2) unique solution
   3) infinite solutions
   CO4 3 (7)

8. Use Dijkstras algorithm to calculate the shortest path between the vertices A and F in the weighted graph given below CO3 3 (7)



9. Use Fleury's algorithm to find an Euler circuit for the given graph CO3 3 (7)



10. Prove that the number of vertices of odd degree in a graph is always even .
    Is it possible to construct a simple graph of 12 vertices with two of them having degree1, three of them having degree 3 and remaining seven having degree10 CO3 2 (7)

11. Find the eigen values and eigen vectors of $\begin{bmatrix} 4 & -3 & 0 \\ 2 & -1 & 0 \\ 1 & -1 & 1 \end{bmatrix}$ CO4 3 (7)

12. Show that the system of equations
    $x + y + z = a, 3x + 4y + 5z = b, 2x + 3y + 4z = c$
    1)has no solution if a=b=c=1
    2)has many solutions if a=b/2=c=1
    CO4 3 (7)

13. find out what type of conic section the quadratic form represents $Q = 7x^2 + 6xy + 7y^2 = 200$ represents CO4 3 (7)

14. Solve the system of equations by gauss elimination method

$x + y - z = 9,$
$8y + 6z = -6$
$-2x + 4y - 6z = 40$

CO4 3 (7)