CSE/IT

Discrete Mathematics
Matching, Covering & Planarity Part-1 | DPP-10
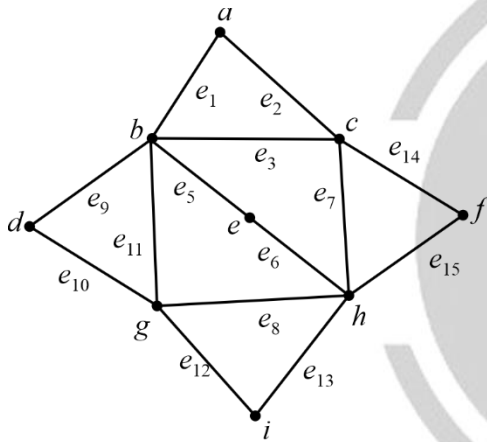
[NAT]

1. If G is a disconnected graph with 11 vertices and maximum number of edges, then matching number of G + chromatic number of G = _____ .

[MCQ]
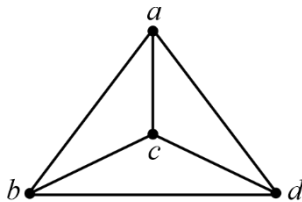
2. The matching number of the graph shown is ____.

(a) 4   (b) 3
(c) 5   (d) 6

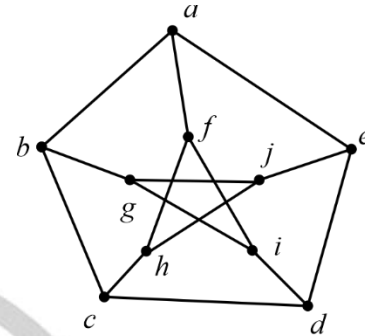**[NAT]**

3. Number of maximal matching in the graph shown below is _____.

[MCQ]
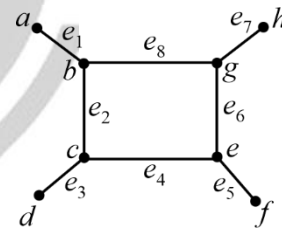
4. The covering number of the graph shown below is _____.

(a) 4   (b) 5
(c) 6   (d) 7

[MCQ]

5. Consider the graph shown below.

Which of the following is correct?

(a) Covering set = $\{e_1, e_4, e_5, e_7\}$
(b) Covering set = $\{e_1, e_3, e_5, e_7\}$
(c) Covering set = $\{e_1, e_3, e_4, e_5, e_7\}$
(d) Covering set = $\{e_3, e_5, e_7, e_8\}$
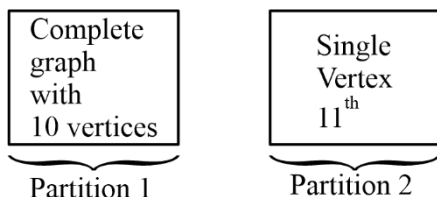
Answer Key

1. (15)
2. (a)
3. (3)

4. (b)
5. (b, c)

Hints and solutions

1. (15)

The given graph G is disconnected graph with 11 vertices and maximum edges.

So,

Complete graph with 10 vertices	Single Vertex 11th
Partition 1	Partition 2

Now,

The chromatic number of $K_{10} = 10$

And

The matching number of complete graph

$$K_{10} = \left\lfloor \frac{n}{2} \right\rfloor = \left\lfloor \frac{10}{2} \right\rfloor = 5$$

∴ Final value $= 5 + 10 = 15$

2. (a)

To find the maximal matching with maximum number of edges, start with the edges with less no of adjacency.
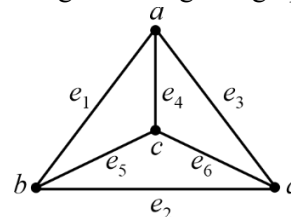
So,

The maximum matching: $\{e_9, e_2, e_6, e_{12}\}$

∴ the matching number of the given graph is 4.

NOTE: The maximal matching set may or may not be unique but matching number will be always unique.

3. (3)

Let's name the edges of the given graph.

I. Maximal matching $m_1 = \{e_1, e_6\}$

II. $m_1 = \{e_2, e_4\}$

III. $m_1 = \{e_3, e_5\}$

Hence, we have total 3 maximal matching set for the graph.

4. (b)

Covering: The set of edges, which covers all the vertices.

Covering No: The size of the smallest covering set.

Now, The smallest covering =

$$\{(a,f),(b,g),(c,h),(d,i),(e,j)\}$$

Hence, the covering number of the given graph is 5.

5. (b, c)

Option a: Incorrect

The covering set edges did not cover vertex "d".

Option b and c: Correct

The given covering set edges covers all the vertices and option b is the minimal covering set.

Option d: Incorrect

The given cover set edges did not cover vertex "a".

Hence, option b and c are the correct option.