

# Discrete Mathematics

## Graph Theory

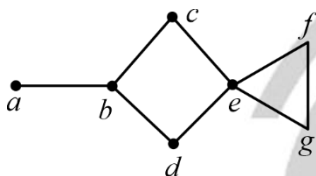
DPP-09

[NAT]

1. If  $G$  is a bipartite graph with 6 vertices and 9 edges then the chromatic number of  $\overline{G}$  = \_\_\_\_.

[MSQ]

2. Consider the graph shown below.

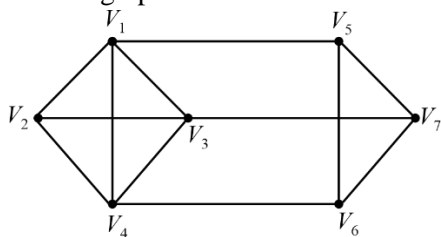


Which of the following option is correct?

- (a) Dominating set =  $\{e, b\}$  and Domination no = 2  
 (b) Dominating set =  $\{a, c, d, f\}$  and Domination no = 4  
 (c) Dominating set =  $\{b, f\}$  and Domination no = 2  
 (d) None of these

[NAT]

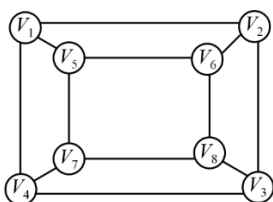
3. For the graph shown below.



Assume  $x$  is the chromatic number of the graph and  $y$  is the domination number then find  $x + y$ ?

[MCQ]

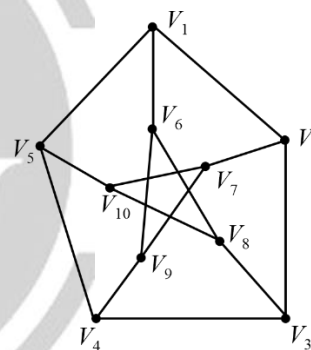
4. Which of the following is/are a independent set for the graph shown below?



- (a)  $\{V_1, V_8, V_2\}$   
 (b)  $\{V_1, V_8\}$   
 (c)  $\{V_2, V_4, V_5, V_8\}$   
 (d)  $\{V_1, V_3, V_6, V_7\}$

[MCQ]

5. Consider the given graph  $G$ .



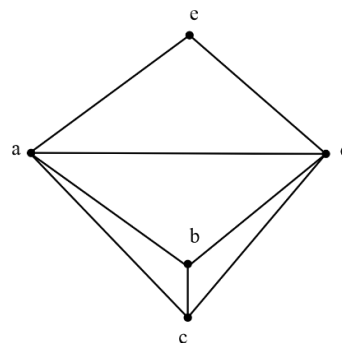
Which of the following option is correct?

$S_1$  : The chromatic number for the given graph is 3.  
 $S_2$  : The independence number of the graph is 4.

- (a)  $S_1$  only  
 (b)  $S_2$  only  
 (c)  $S_1$  and  $S_2$  both  
 (d) Neither  $S_1$  nor  $S_2$

[NAT]

6. For the graph shown below, the chromatic number is \_\_\_\_.



## Answer Key

- |              |        |
|--------------|--------|
| 1. (3)       | 5. (c) |
| 2. (a, c)    | 6. (4) |
| 3. 6         |        |
| 4. (b, c, d) |        |

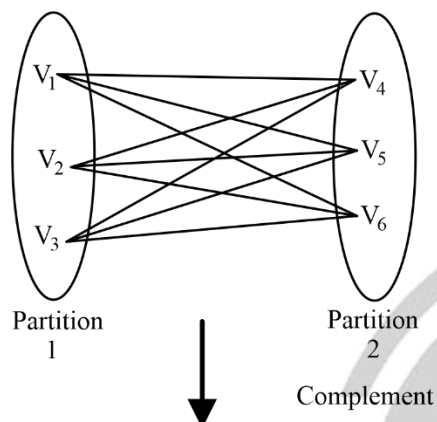


## Hints and solutions

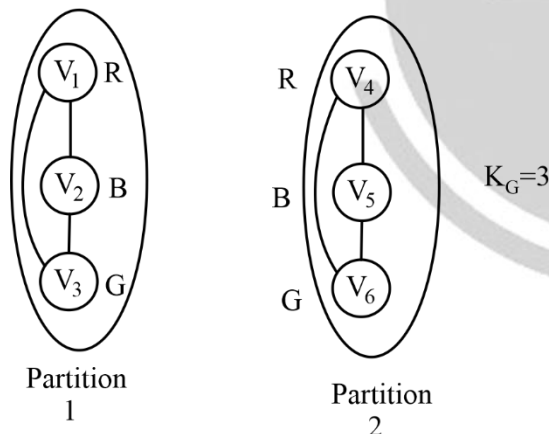
1. (3)

In the problem we have a bipartite graph with 6 vertices and 9 edges

So,



The complement of the bipartite graph will have complete graph with 3 vertices within partition 1 and partition 2.



Hence, the chromatic number of  $\bar{G}$  is 3

2. (a, c)

**I. Dominating Set:** The set of vertices from which the whole graph can be covered in the single move.

**II. Domination No:** The smallest/minimal dominating set.

**Option a and c:** correct

The vertex sets  $\{e, b\}$  and  $\{b, f\}$  covers the complete graph and it is also the minimal dominating set with Domination number is 2.

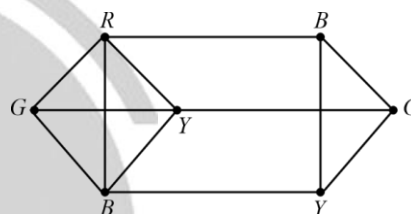
**Option b:** Incorrect

As the vertex set  $\{a, c, d, f\}$  is the dominating set but it is not the minimal dominating set.

Hence, the domination number 4 is incorrect

3. (6)

**I. Chromatic number:** The above graph have complete graph ( $K_4$ ) so, the ' $K_G \leq 1 + \Delta(G)$ ' and due to complete graph ' $K_4$ ', we need at least '4' color for  $K_4$ .



Hence, the chromatic number is 4 so,  $x = 4$ .

**II. Domination Number:** To find the minimal dominating set, always start with maximum degree vertex.

$\therefore$  Dominating set =  $\{V_1, V_6\}$

Hence, the domination No. is 2 so,  $y = 2$

$\therefore x + y = 4 + 2 = 6$

4. (b, c, d)

**Independent Set :** The set of vertices which are not adjacent to each other.

**Option a :** Incorrect

As vertex  $V_1$  is adjacent to vertex  $V_2$ .

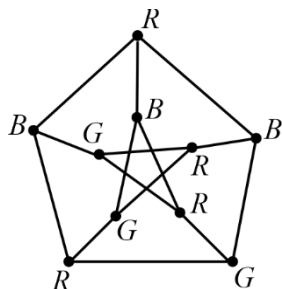
Hence, given vertex set is not independent set.

**Option b, c, d :** Correct

All the vertices of option b, c, d are adjacent to none within the set.

Hence, b, c, d are the independent set of given graph.

5. (c)

**Statement  $S_1$  :** True

Hence, the chromatic number of the graph is 3.

**Statement  $S_2$  :** True

All the red (R) colored vertices could be the maximal independent set.

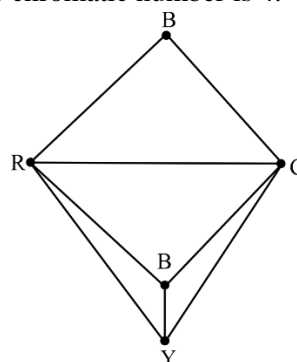
Independent Set :  $\{V_1, V_4, V_7, V_8\}$

Hence, the independence number of the graph is 4

6. (4)

The graph contains complete graph of 3 vertices ( $K_3$ ) so, the chromatic number will be at least 3.

Hence, the chromatic number is 4.



Any issue with DPP, please report by clicking here:- <https://forms.gle/t2SzQVvQcs638c4r5>

For more questions, kindly visit the library section: Link for web: <https://smart.link/sdfez8ejd80if>



**PW Mobile APP:** <https://smart.link/7wwosivoicgd4>