CSE/IT

Discrete Mathematics

Types of Graphs Part – 3

DPP-04

[MCQ]

1. If a hypercube (Q_n) is given with edges 193, then the number of vertices will be

(a) 6
(b) 5
(c) 7
(d) None of these

[MCQ]

2. consider the following statements:

S_1: Every hypercube graph is a bipartite graph.

S_2: Every bipartite graph is also a hypercube

Which of the following options is True?

(a) S_1 only (b) S_2 only
(c) Both S_1 and S_2 (d) Neither S_1 nor S_2

[NAT]

3. A certain graph G has order 16 and size 29. The degree of each vertex of G is 3, 4 or 5. There are six vertices of degree 4. How many vertices of G having degree 5?

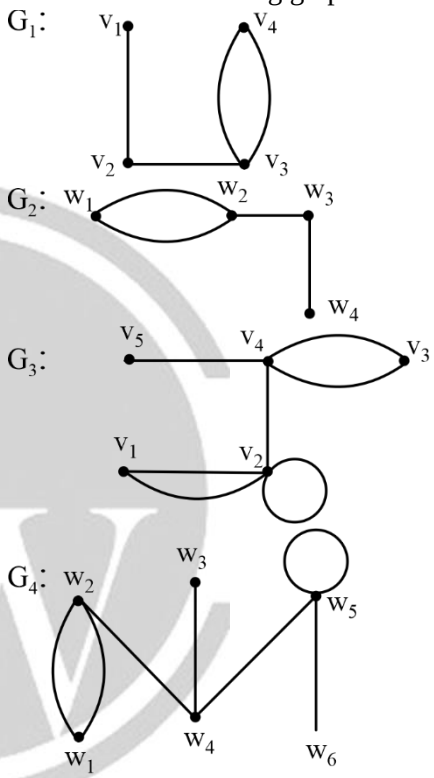
[MCQ]

4. If the sequence x, 7, 7, 5, 5, 4, 3, 2 is graphical then what are the possible value of x ($0 \le x \le 4$)?

(a) 0 (b) 2
(c) 3 (d) 1

[MSQ]

5. Which of the following graphs are isomorphic graph?



(a) G_1 and G_2 are isomorphic
(b) G_3 and G_4 are isomorphic
(c) G_1 and G_2 are not isomorphic
(d) G_3 and G_4 are not isomorphic

Answer Key

1. (d)
2. (a)
3. (2)
4. (c)
5. (a, d)

Hints and solutions

1. (d)

As we know that the number of edges in a hypercube (Q_n) is given as:

Number of edges = $n.2^{n-1}$

$\therefore \quad 193 = n.\ 2^{n-1}$

Here for any integer value of 'n', the hypercube would not contain 193 edges.

Hence, the correct option is d.

2. (a)

Statement S_1 : True

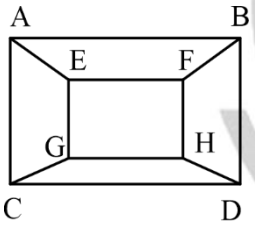
Every hypercube have cycle of length even hence it is possible to divide the vertices into two sets.

So, Every hypercube is a bipartite graph.

Statement S_2 : False

Every bipartite graph is not hypercube graph.

Example:



The above graph is bipartite graph as V_1 = {A, G, F, D} and V_2 ={B, E, H, C} with number of edge = 12 and vertices = 8.

Still the above graph is not hypercube.

3. (2)

I. In the problem number of vertices is given 16 and number of edges given is 29.

Now, we have 6 vertices of degree 4.

Assume x is total number of vertices with degree 5.

So, number of vertices with degree 3 will be :

(16 – 6 –x) = (10 – x)

II. Now, by using Handshaking lemma:

Sum of degree = 2 * |E|

$\therefore \quad (6 * 4) + (x * 5) + (10 - x) * 3 = 2 * 29$

$\Rightarrow \quad 24 + 5x + 30 - 3x = 58$

$\Rightarrow \quad 5x - 3x = 58 - 54$

$\Rightarrow \quad 2x = 4$

$\therefore \quad x = 2$

Hence, we have 2 vertices with degree 5 and 8 vertices with degree 3.

4. (c)

I. In any graph the number of odd degree vertices must be even. Now, in the given degree sequence, we have 5 vertices with odd degree

{7, 7, 5, 5, 3}

Thus, the value of x must be odd number between 0 to 4 that is either 1 or 3.

II. Now, case I assume x = 1:

Degree sequence: 1, 7, 7, 5, 5, 4, 3 ,2

⇓ order

7, 7, 5, 5, 4, 3, 2, 1

as we know that if we have 2 vertices with maximum degree (n - 1) then the degree of each vertex must be ≥ 2.

Thus, x will be 3 only.

Hence, right answer is option c.

5. (a, d)

I. G_1 and G_2 are isomorphic as it has equal number of vertices, edges and same degree sequence.

II. G_3 and G_4 are not isomorphic because incident property not satisfied.

Degree of V_2 is 5 in G_3 but there is not any vertex in G_4 with same degree.

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