Indian Institute of Technology Kharagpur

AUTUMN Semester 2020
COMPUTER SCIENCE AND ENGINEERING

CS 60047 Advanced Graph Theory

Online MCQ Test 1   Date: 26 September 2020

Full Marks: 48   Credit: 20%   Time: 12:00 noon – 1:30 PM

Instructions: This is an OPEN-BOOK, OPEN-NOTES, MCQ Test. For each question, please choose one answer from the given choices. Each *correct answer* will fetch 4 points, *incorrect answer* will contribute 0 point, and *no answer* leads to 1 point. You may use calculators if required.

Submission of answers: Please create a text file including your name, roll-number, and your choice of option against each question, and submit it to the CSE Moodle Page by 1:45 PM on 26 Sept. 2020.

1. $G(V, E)$ is a simple undirected graph, whose vertices are labeled as 1, 2, 3, …, 10, and the degree of each vertex in V is even. The number of such distinct (labeled) graphs with 10 vertices that can be constructed is

A. 2^{45},   B. 2^{44},   C. 2^{36},   D. 10!,   E. none of these

2. 100 students including Eshan are attending a gathering and each student has at least one friend present in the same gathering. When Eshan asks each of the other 99 students how many friends of theirs are present, each gives a different answer. The number of Eshan's friends that are present in the gathering is

A. 100,   B. 70,   C. 50,   D. 47,   E. none of these

3. In a committee C of four persons, two are not friends and refuse to shake hands with each other. All other pairs agree to shake hands. There is another group S of persons, who are happy to shake hands with anyone. A bigger committee $C \cup S$ will now be formed such that everyone in the new committee can shake hands with exactly three others. The minimum cardinality of S is

A. 2,   B. 3,   C. 4,   D. 6,   E. none of these

4. The maximum number of edges in a simple 3-partite graph with 100 vertices is

A. 3333,   B. 3644,   C. 4900,   D. 37026,   E. none of these

5. Consider Petersen graph (*PG*) as shown below. The minimum number of edges to be deleted from *PG* so that the residual graph becomes bipartite is
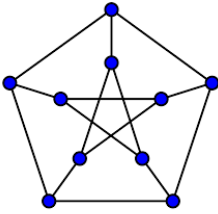
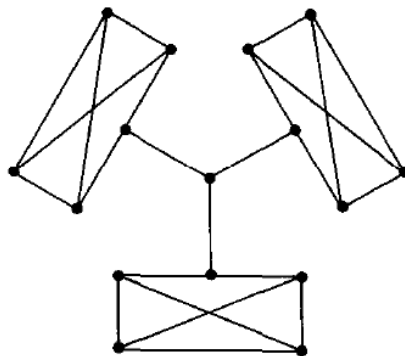A. 2,   B. 3,   C. 4,   D. 5,   E. none of these

6. The number of 4-cycles in hypercube Q_4 is

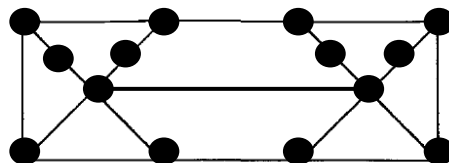A. 12   B. 16,   C. 24,   D. 32,   E. none of these

7. The size of the minimum dominating set and the largest independent set in the following graph is respectively

A. (3, 7),   B. (4, 6)   C. (5, 6),   D. (4, 7)   E. none of these


8. The diameter of the graph shown below is

 A. 4,   B. 5,   C. 6,   D. 7,   E. none of these

9. The nodes of a grid graph, shown below, represent cities and the edges denote road-segments with both-way traffic. However, most of the road-segments are damaged and need repair. The maximum number of road segments that can be repaired simultaneously so that a driver can still travel between any pair of cities, is
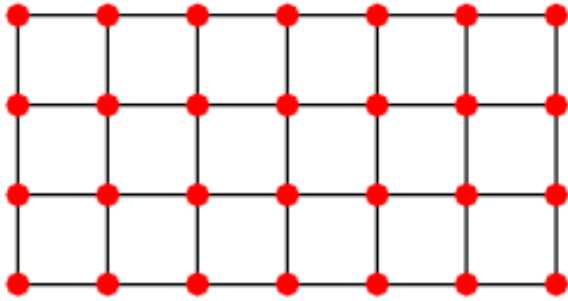
A. 12,   B. 18,   C. 19,   D. 21,   E. none of these

10. We want to draw the above grid graph (shown in Question #9) by pencil strokes without lifting it after engagement and without drawing an edge more than once. The minimum number of pencil strokes needed to draw it completely, is:
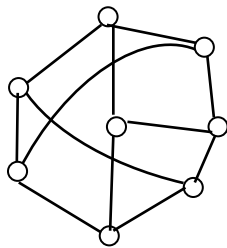
A. 3,   B. 6,   C. 7,   D. 8,   E. none of these

11. Let G be simple graph with 20 vertices. The maximum number of edges G can have so that G has an independent vertex set of size 10, is:
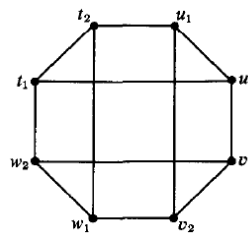
A. 55,   B. 100,   C. 145,   D. 180,   E. none of these

12. Consider the three graphs shown below: $G1$, $G2$, $G3$. Which one of the following statements is true?
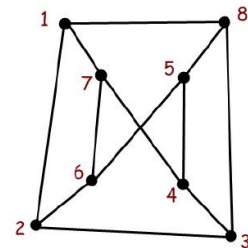
A. $G1$ and $G2$ are isomorphic;   B. $G1$ and $G3$ are isomorphic;   C. $G2$ and $G3$ are isomorphic;

D. All three are isomorphic;   E. No pair is isomorphic

$G1$

$G2$

$G3$

3