*

1 point

In a cyclic group G= $\{1, \omega, \omega^2\}$ where ω is a cube root of unity under multiplication its generators are

A. $\{\omega\}$

B. $\{\omega^2, 1\}$

C. $\{\omega, \omega^2\}$

D. $\{\omega^2\}$

- (○) A
- (○) B
- (●) C
- (○) D

*

1 point

Which of the following is a group

A. $\{N,+\}$

B. $\{N,\bullet\}$

C. $\{E,\bullet\}$

D. $\{Z\ ,+\}$

- [ ] A
- [ ] B
- [ ] C
- [x] D

*

1 point

If the minimum distance between any two code words is atleast 5, then maximum number of errors that can be corrected is

A. 2
B. 3
C. 4
D. 5

- (●) A
- ( ) B
- ( ) C
- ( ) D

*

1 point

Let $x = 10110, y = 11110, z = 10011$. Find the minimum distance between these code words

A.3
B. 2
C. 1
D. 4

- ( ) A
- ( ) B
- (●) C
- ( ) D

*

1 point

Find the weight of the word $x = 11100$ in B^5

A. 1
B. 4
C. 2
D. 3

- A
- B
- C
- D

*

1 point

In a permutation group S if $P=\begin{pmatrix}1&2&3&4&5&6&7\\7&3&2&1&4&5&6\end{pmatrix}$ then P^{-1} is

A. $P^{-1}=\begin{pmatrix}1&2&3&4&5&6&7\\4&3&2&5&6&7&1\end{pmatrix}$

B. $P^{-1}=\begin{pmatrix}1&2&3&4&5&6&7\\3&4&2&5&6&7&1\end{pmatrix}$

C. $P^{-1}=\begin{pmatrix}1&2&3&4&5&6&7\\4&3&5&2&6&7&1\end{pmatrix}$

D. $P^{-1}=\begin{pmatrix}1&2&3&4&5&6&7\\4&3&2&5&6&1&7\end{pmatrix}$

- (●) A
- ( ) B
- ( ) C
- ( ) D

*

1 point

If $*$ is the binary operation on the set of positive rational numbers defined by $a*b=\frac{ab}{2}$, then the identity element is

A. 1
B. -1
C. 2
D. 3

- (○) A
- (○) B
- (◉) C
- (○) D

*

1 point

A cyclic group is always

A. non abelian

B. abelian

C. non commutative

D. permutation group

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

A commutative ring with unity and without zero divisors is called an

A. Field
B. Integral domain
C. Non abelian ring
D. Integral field

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

Number of positions in the given strings $x_1x_2...x_n$ and $y_1y_2...y_n$ for which x_i does not equal to y_i is called as

A. Hamming constant
B. Lagrange Constant
C. Lagrange distance
D. Hamming distance

- [ ] A
- [ ] B
- [ ] C
- [x] D

*

1 point

A graph in which loops and parallel edges are not allowed is called a .....
(A) weighted graph
(B) simple graph
(C) multigraph
(D) pseudograph

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

A vertex which is adjacent to exactly one vertex in a graph is called ..... vertex
(A) isolated
(B) pendant
(C) incident
(d) simple

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

How many vertices are there in a graph with 16 edges and every vertex has degree 4?
(A) 4
(B) 8
(C) 9
(D) 16

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

How many edges are there in a complete bipartite graph $K_{5,4}$?
(A) 35
(B) 9
(C) 20
(D) 25

- [ ] A
- [ ] B
- [x] C
- [ ] D

*

1 point

Which of the following graph is connected and has no circuits?
(A) Cyclic graph
(B) Regular graph
(C) Tree
(D) Complete graph

- [ ] A
- [ ] B
- [x] C
- [ ] D

*

1 point

Which of the following statement for a graph is correct?
(A) Simple path in a graph crosses the vertex any number of times.
(B) A graph can exists without edges.
(C) An edge in a graph is incident on more than two vertices.
(D) Sum of the degrees of vertices is odd.

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

Length of the path of a graph is defined by the
(A) Number of vertices in the graph
(B) Number of edges in the path
(C) Number of vertices in the path
(D) Number of edges in the graph

- [ ] A
- [x] B
- [ ] C
- [ ] D

*

1 point

A ..... circuit of G is a circuit which includes every edge of G exactly once?
(A) Euler
(B) Hamiltonian
(C) Planar
(D) Isomorphic

- [x] A
- [ ] B
- [ ] C
- [ ] D

*

1 point

Choose the correct statement
(A) Every complete graph is Completely bipartite
(B) Every complete graph is Tree
(C) Every complete graph is Regular
(D) Every complete graph is Bipartite

- A
- B
- C
- D

*

1 point

What is the chromatic number of a circuit of length 8 (C_8)?
(A) 8
(B) 5
(C) 2
(D) 3

- A
- B
- C
- D

PART-B ANSWER ANY FIVE QUESTIONS (5*4=20 Marks), PART-C ANSWER ANY ONE QUESTION (1*10=10 Marks)

Instructions:

Part-B and C descriptive questions should be answered in A4 white sheets and scanned PDF should be uploaded in ‘ADD FILE’. The work sheet should contain the following:

(a) Register number and name in each and every page along with watermark (Register number).

(b) File name should be ‘CT3-425’ (if your register number is RA2021....425, the last three digits of your register number).

(c) Convert into a single pdf file and water marking of your REGISTER NUMBER in the answer sheet to be done.

*

30 points

PART-B ($5 \times 4 = 20$ **Marks**)

Answer any **five** questions

21. Assume that $f{:}G \to G'$ is a group homomorphism from $(G, *)$ to (G', Δ). Show that kernel of f is a subgroup of G.

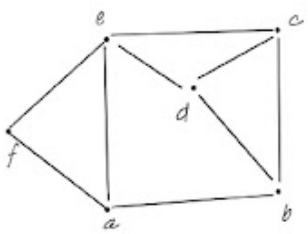
22. Examine whether the identity element of a group $(G, *)$ is unique.

23. Examine whether the set of integers $(Z, +)$ is a subgroup of set of real numbers $(R, +)$ or not under the operation addition.

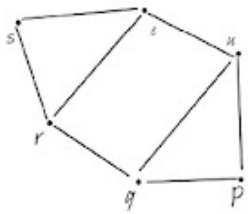
24. Determine the order of each element of the multiplicative group $\{1, \omega, \omega^2\}$ where ω is the cube root of unity under multiplication.

25. Illustrate with an example of a graph which (i) contains an eulerian circuit and a hamiltonian circuit, (ii) contains an eulerian circuit but not a hamiltonian circuit.

26. Examine whether the following graphs are isomorphic.

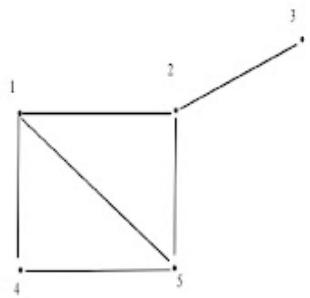


G



H

27. Construct the adjacency matrix of the following graph.

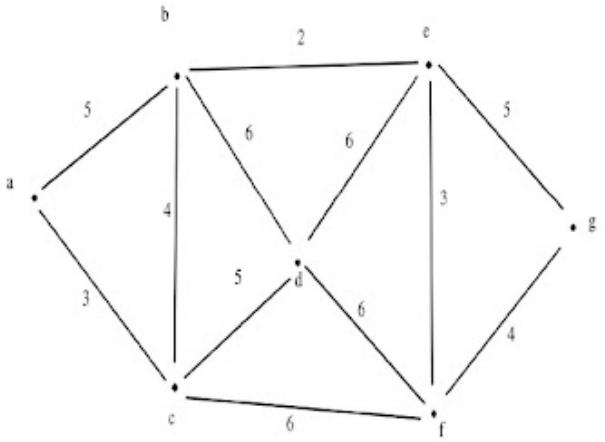


PART-C ($1 \times 10 = 10$ **Marks**)

Answer any **one** question

28. List the code words generated by the encoding function $e : B^3 \to B^6$ with respect to the parity check matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

29. Apply Kruskall's Algorithm to identify the minimum spanning tree and minimum weight of the following graph.



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