

(4)

diagram. What is proper subset? Explain with the help of an example. What are the properties of Binary Relations? 3+2+1+4

24. (i) Solve the recurrence relation :

$$a_n = 2a_{n-1} + 2^n; a_0 = 2 \quad 5$$

- (ii) For every positive integer n , prove that $7^n - 3^n$ is divisible by 4. 5

25. (i) Define planar graph with example. Draw a Q_3 graph. Is Q_3 is a planar graph? Justify. 2+2

- (ii) The graph G has 6 vertices with degrees 2, 2, 3, 4, 4, 5. How many edges does G have? Could it be planar? If so, how many faces would it have? If not explain. 6

Total Pages : 4

B.Sc./2nd Sem (H)/COS/24(CBCS)

2024

2nd Semester Examination

COMPUTER SCIENCE (Honours)

Paper : C 4-T

(Discrete Structure)

[CBCS]

Full Marks : 60

Time : Three Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any **ten** questions. 2×10=20

1. Define Path and Circuit in a graph.
2. Show that $\sqrt{3}$ is irrational.
3. Define cartesian product of two set with a proper example.
4. What is proper subset? Explain with the help of an example.
5. Draw the Venn diagram for the expressions
(i) $A \cup B \cap C$ (ii) $A \cap B \cap C$.

P.T.O.

(2)

6. Write the following statements in the symbolic form :
- (i) Everything is correct.
- (ii) All birds cannot fly.
7. For two sets A and B , let $A \Delta B$ denote the set of elements which belong to A or B but not both. If $P = \{1, 2, 3, 4\}$, $Q = \{2, 3, 5, 6\}$, $R = \{1, 3, 7, 8, 9\}$, $S = \{2, 4, 9, 10\}$, then find the number of elements in $(P \Delta Q) \Delta (R \Delta S)$.
8. Find the maximum number of edges in K_{13} .
9. Define a complete Graph with a suitable example.
10. Show that $(p \rightarrow q) \rightarrow q = p \vee q$.
11. Show that $p \wedge (p \vee q) \leftrightarrow p$ is a tautology.
12. How many 3-letter words can be formed from the letters of the word "HAPPY"?
13. What is contradiction?
14. Define multigraph with example.
15. If $A = \{2, 3, 4, 5\}$ and $B = \{0, 1, 2, 3\}$, find $(A \cap B)$.

Group - B

Answer any **four** questions. $5 \times 4 = 20$

16. If $A = \{1, 4\}$, $B = \{2, 3, 6\}$, $C = \{2, 3, 7\}$, then verify that $A \times (B - C) = (A \times B) - (A \times C)$.

(3)

17. In how many ways 9 balls can be selected from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each colours?
18. A simple graph contains 35 edges, four vertices of degree 5, five vertices of degree 4 and four vertices of degree 3. Find the number of vertices with degree 2.
19. Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.
20. Using Mathematical Induction, prove that :
- $$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$
21. Show that in any group of 30 people, you can always find 5 people who were born on the same day of the week.

Group - C

Answer any **two** questions. $10 \times 2 = 20$

22. (i) If ${}^{2n}C_3 : {}^nC_3 = 11:1$, find n . 5
- (ii) How many distinct four digit integer can one make from the digits 1, 3, 3, 7, 7, 8? 5
23. Explain De Morgan's Laws with the help of Venn

P.T.O.