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I Semester B.C.A. Degree Examination, April - 2023

COMPUTER APPLICATIONS

Discrete Structures

Paper : CA-CIT

(NEP 2021 Onwards Scheme)

Time : 2½ Hours

Maximum Marks : 60

Instructions to Candidates:Answer any **Four** questions from each part.**PART - A**Answer any **Four** questions. Each question carries **2** marks.**(4×2=8)**

1. Define power set with an example.
2. Construct the truth table for the proposition $(p \vee \sim q)$.
3. Define Equivalence Relation.

4. If $\begin{vmatrix} 1 & 2 & -1 \\ 3 & x & -2 \\ 1 & 2 & -3 \end{vmatrix} = 0$ then find x ?

5. Define pseudo graph with an example.
6. Write the planar representation of graph K_4 .

PART - BAnswer any **Four** questions. Each question carries **5** marks.**(4×5=20)**

7. Show that the proposition $(p \rightarrow q) \leftrightarrow \sim p \vee q$ is a Tautology.
8. Prove by mathematical induction $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$, \forall positive integers 'n'.
9. State and prove Pigeonhole principle.

[P.T.O.]



(2)

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10. Find the rank of the matrix $\begin{bmatrix} 1 & 1 & 1 & 6 \\ 1 & 2 & 3 & 14 \\ 1 & 4 & 7 & 30 \end{bmatrix}$.

11. Find the inverse of the matrix $\begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$.

12. Define the following terms.

- i) Path
- ii) Circuit
- iii) Walk
- iv) Trail
- v) Loop

PART - C

Answer any **Four** questions. Each question carries **8** marks. (4×8=32)

13. a) If $A = \{1, 3, 5, 7, 6\}$, $B = \{2, 4, 6, 1, 7\}$ and $C = \{3, 7, 11, 5\}$ verify $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
- b) In a group of 80 people, 42 like Coffee, 60 like Tea and each person like atleast one of the two drinks. Find how many people like both Coffee and Tea? (4+4)
14. a) Let $A = \{1, 2, 3, 4, 6\}$, R is a relation on A defined by $R = \{(a, b) : a, b \in A \text{ "a divides b"}\}$
Write (i) matrix representation of R . (ii) Digraph of R .
- b) If $f : R \rightarrow R$ is defined by $f(x) = 4x + 5$ then show that f is invertible. (4+4)
15. a) Write the converse, Inverse and contrapositive of the given statement "If two integers are equal then their squares are equal".
- b) How many arrangements can be made from the letters of the word "ASSASSINATION"?
In how many of these arrangements do the four S's not come together? (3+5)



16. a) If $A = \begin{bmatrix} 5 \\ 2 \\ -3 \end{bmatrix}$ and $B = [-1 \ 4 \ 6]$ show that $(AB)' = B'A'$.

b) Solve the following system of equations

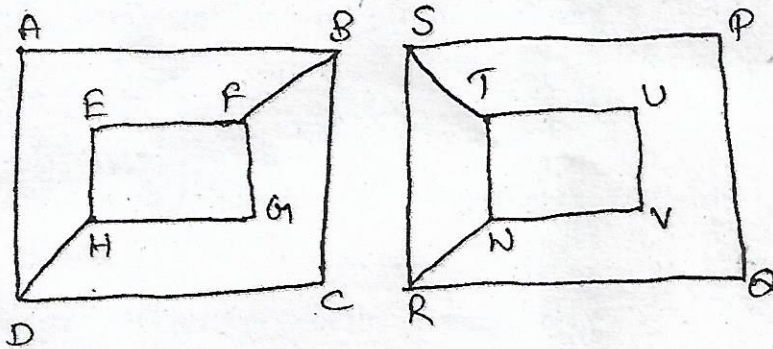
$$3x - 2y + 3z = 8$$

$$2x + y - z = 1$$

$$4x - 3y + 2z = 4$$

(3+5)

17. a) Examine whether the following graphs are Isomorphic (or) not



b) Define spanning tree with an example.

(6+2)

18. Find the minimum weight spanning tree by Prim's Algorithm.

(8)

