

II Semester B.C.A. Degree Examination, September/October 2022
(NEP - 2021.22 Syllabus)
DISCRETE MATHEMATICS

Max. Marks : 60

Time : 2 Hours

PART - A**(5 × 2 = 10)**Answer **any five** questions :

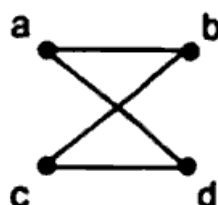
1. Define symmetric matrix and skew symmetric matrix.
2. Prove the given proposition is false by giving counter example for $x^2 - 4x + 3 = 0, \forall x \in \mathbb{R}$ such that $2 \leq x \leq 3$.
3. How many 4 digit numbers can be formed by using the digits 1 to 9 if repetition of digits is not allowed?
4. A committee of 3 persons is constituted from a group of 2 men and 3 women. In how many ways can this be done?
5. If $A = \{1, 2, 3\}$ and $B = \{3, 5, 7\}$ then find $(A - B) \times B$.
6. Define Symmetric relation with an example.
7. Define planar graph. Give an example.
8. Define Chromatic number.

PART - BAnswer **any five** of the following questions :**(5 × 4 = 20)**

9. Symbolise the quantified statement and negate it.
 "Some students are lazy or all students are hard working".
10. Let Q be the set of all rational numbers and the function $f : Q \rightarrow Q$ be defined by $f(x) = 2x + 3, \forall x \in Q$. Then prove that $f(x)$ is bijective function.
11. Expand $(2x - 3)^6$ by using Binomial theorem.

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12. Solve the recurrence relation $a_n - 7a_{n-1} + 10a_{n-2} = 0$, $a_0 = 0$, $a_1 = 3$ by characteristic root method.
13. Prove that $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$.
14. If $A = \{x/x^2 - 5x + 6 = 0\}$, $B = \{2, 4\}$ and $C = \{4, 5\}$ then find $A - B$, $B - C$ and $(A - B) \times (B - C)$.
15. How many paths of length four are there from 'a' to 'd' in the given graph.



16. Prove that there is a single path between every pair of distinct vertices of a connected undirected graph.

PART - C

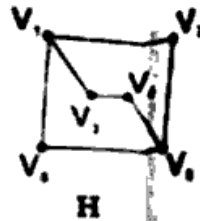
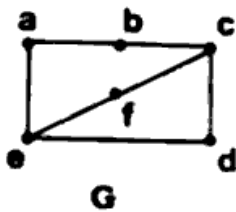
Answer any three of the following questions :

(3 × 10 = 30)

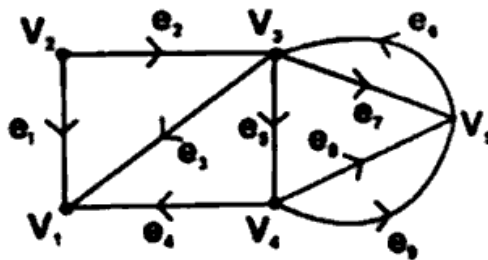
17. (a) Prove that the compound propositions $\neg(p \Rightarrow q)$ and $p \wedge (\neg q)$ are logically equivalent.
- (b) Let $p(x)$ and $q(x)$ be the predicates with same replacement set. Then prove that the truth set of the conjunction $p(x) \wedge q(x)$ is the intersection of their truth sets. <https://www.kuvempuonline.com>
18. (a) In a class of 35 students, 24 like to play cricket and 16 like to play football. Also, each student likes to play atleast one of the two games. How many students like to play both cricket and football?
- (b) Find r if ${}^5P_r = 6 {}^5P_{r-1}$.
19. (a) Let R be a relation defined on the set Z of integers by $R = \{(x, y) / x - y \text{ is divisible by } 5\}$. Then show that R is an equivalence relation.
- (b) If $A = \{1, 2, 3, 4\}$ and R and S are two relations on a set A defined by $R = \{(1, 2), (1, 3), (2, 4), (4, 4)\}$, $S = \{(1, 1), (1, 2), (1, 3), (1, 4), (2, 3), (2, 4)\}$ then find $R \circ R$, $S \circ S$ and $R \circ (R \circ S)$.



20. (a) Show that the following graphs are isomorphic.



- (b) Find the incidence matrix for the given graph.



21. (a) Prove that every natural number greater than or equal to 2 is a product of primes.
- (b) Let $A = \{1, 2, 3\}$ and $B = \{1, 2, 3, 4\}$. Relation R defined on set A and relation S defined on set B by $R = \{(1, 1), (2, 2), (3, 3)\}$ and $S = \{(1, 1), (1, 2), (1, 3), (1, 4)\}$. Then find $R \cap S$, $R - S$, R^c , R^{-1} , S^{-1} .

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