Reg. No. | | | | | | | | | |

BCACACN 201

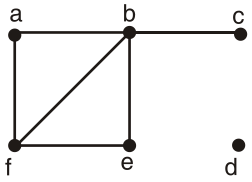
Second Semester B.C.A. Degree Examination, September 2022
(NEP – 2020) (2021-22 Batch Onwards)
DISCRETE MATHEMATICAL STRUCTURES (DSCC)

Time : 2 Hours Max. Marks : 60

Note : *Answer **any six** questions from Part – **A** and **one full** question from **each** Unit in Part – **B**.*

PART – A **(6×2=12)**

1. a) Write which of these is a tautology or a fallacy i) $p \vee \neg p$ ii) $p \wedge \neg p$.
   b) Write the power set of A = {1, 2}.
   c) Define partial order relation. Give an example.
   d) What is Pigeonhole principle ? Give an example.
   e) What is the probability that when two dice are rolled, the sum of the numbers on the two dice is 7 ?
   f) Define prime and composite number.
   g) Define degree of a vertex, with an example.
   h) Find isolated and pendant node in the graph :



PART – B

UNIT – I

2. a) Using truth table, show that $(p \wedge q) \Rightarrow p$ and $p \Rightarrow (p \vee q)$ are both tautologies, where p and q are any two statements.
   b) A = {3, 4, 5, 17}, B = {1, 2, 3}, C = {x|x is an integer and $0 \leq x \leq 5$} write $A \cup B$, $A \cup C$.
   c) R = {<1, 2>, <3, 4>,<2, 2>}, S = {<4, 2>, <2,5>, <3,1>, <1,3>}. Write $R \circ S$ and $S \circ S$. **(4+4+4)**

P.T.O.

3. a) With the help of truth table, prove that $p \Rightarrow (q \wedge r) \equiv (p \Rightarrow q) \wedge (p \Rightarrow r)$.

   b) R = {<1, 1>, <1, 2>, <1,4>, <2,1>, <2, 2>, <2, 3>, <3, 2>, <3, 3>, <4, 2>, <4, 4>} Construct relation matrix of R and draw digraph of R.

   c) A = {1, 2, 3}, B={1, 2, 5, 7, 9}. Write A – B, A + B, $A \cup B$, $A \cap B$. **(4+4+4)**

UNIT – II

4. a) Draw the Hasse diagram of the set A, under the partial ordering relation "divides" and indicate those which are totally ordered. A = { 1, 2, 3, 6, 12}.

   b) A multiple-choice test contains 10 questions. There are four possible answers for each question. A) In how many ways can a student answer the questions on the test if the student answers every question ? B) In how many ways can a student answer the questions on the test if the student can leave answers blank ?

   c) Show that functions $f(x) = x^3$ and $g(x) = x^{1/3}$ for $x \in R$ are inverse of one another. **(4+4+4)**

5. a) Let X = {1, 2, 3} f, g, h and s are the functions from X to X given by

   f = {(1, 2), (2, 3),(3, 1)}, h={(1,1),(2, 2), (3, 1)}, g = {(1,2), (2, 1),(3, 3)}, s = {(1, 1), (2, 2), (3,3)}. Find $f \circ g$, $g \circ f$, $s \circ s$ and $f \circ s$.

   b) A computer company receives 350 applications from computer graduates for a job planning a line of new web servers. Suppose that 220 of these applicants majored in computer science, 147 majored in business, and 51 majored both in computer science and in business. How many of these applicants majored neither in computer science nor in business ?

   c) Let S = {1, 2, 3, 4, 5}. List all the 3-permutations and 3-combinations of S. **(4+4+4)**

UNIT – III

6. a) Find the probability that a hand of five cards in poker contains four cards of one kind.

   b) What is the conditional probability that a family with two children has two boys, given they have at least one boy ?

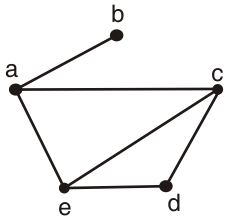
   c) Find the greatest common divisor of 414 and 662 using the Euclidean algorithm. **(4+4+4)**

7. a) Are the random variables x_1 and x_2 independent, if the sum of the numbers that appear when a tair of fair dice is rolled ?

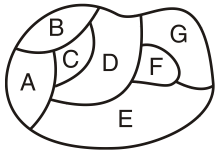
   b) Use mathematical induction to prove that $2n < n!$ for every integer n with $n \geq 4$. **(6+6)**

UNIT – IV

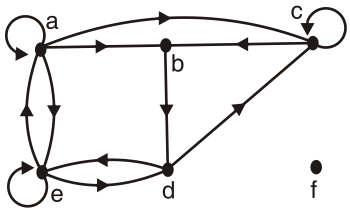
8. a) Write adjacency list and adjacency matrix to describe the simple graph given in the figure.



   b) Construct the dual graph for the given map. **(6+6)**



9. a) Find the in-degree and out degree of each vertex in the graph G with directed edges as shown in the figure.



   b) Convert the following tree into a binary tree. **(6+6)**