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

BCACACN 202

Second Semester B.C.A. Degree Examination, July/August 2023
(NEP 2020) (2021 – 22 Batch Onwards)
DATA STRUCTURES USING C (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

1. a) Define linear data structure. Give an example. **(6×2=12)**
   b) Consider the linear array AA(5:50). Find the number of elements in an array.
   c) What is sparse matrix ? Give example.
   d) Write one advantage and disadvantage of binary search.
   e) What is Linked List ? List the different types.
   f) Write the algorithm for POP operation in Stack using array.
   g) Define the terms with respect to tree :
      i) leaf node
      ii) depth of a tree.
   h) Define adjacency matrix.

PART – B

Unit – I

2. a) Write the classification of data structure and briefly explain it.
   b) Write an algorithm for Bubble sort.
   c) Explain the selection logic with example. **(4+4+4)**
3. a) Explain the representation of two dimensional array in memory.
   b) Trace the following list of numbers using selection sort technique :
   77, 33, 44, 11, 88, 22, 66, 55. **(6+6)**

P.T.O.

Unit – II

4. a) What is Linear Search ? Write the algorithm for linear search.
   b) Explain any two dynamic memory allocation functions used in 'C' with syntax and example.
   c) Write the algorithm to insert a node at the beginning of the linked list. **(4+4+4)**

5. a) Explain binary search with an example.
   b) Write an algorithm to delete a node following a given node of a linked list.
   c) Explain the representation of linked list in memory. **(4+4+4)**

Unit – III

6. a) Write an algorithm to evaluate postfix expression using stack.
   b) Write an algorithm to perform insertion operation on queue using array.
   c) Convert the infix expression to postfix : a * b – c ^ d + e/f. **(4+4+4)**

7. a) Using Stack convert the given infix expression to postfix.
   (A + B) * (C – D)/E * F
   b) Write an algorithm for PUSH operation onto a Stack using Linked List.
   c) Evaluate the following Postfix expression showing the Stack status.
   P : 5, 6, 2, +, *, 1, 4, 2, /, ^, * **(4+4+4)**

Unit – IV

8. a) Draw the Binary Search Tree for the following numbers and Traverse it in Preorder, Inorder and Postorder :
   60, 40, 100, 80, 45, 35, 120, 105
   b) Explain the method of representing the graphs using sequential method with an example. **(6+6)**

9. a) Draw the binary tree for the expressions given below. Also traverse in preorder, postorder and inorder :
   A + B – C ^ D / E * F
   b) Write an algorithm for breadth first search (BFS) for a graph. **(6+6)**

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BCACACN 101

First Semester B.C.A. Degree Examination, February/March 2023
(NEP – 2020)
(2021 – 22 Batch Onwards)
FUNDAMENTALS OF COMPUTERS
(DSCC)

Time : 2 Hours Max. Marks : 60

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

PART – A

(6×2=12)

1. a) What is Cache memory ?
   b) Differentiate RAM and ROM.
   c) Define System Software. Give example.
   d) Convert $(AB2)_{16}$ to Binary and Octal.
   e) Write the BCD and Excess-3 Codes for 57.
   f) Write 1's and 2's Complement for $(10101011)_2$.
   g) Draw the logic circuit for F (x, y, z) = x y + x′ z′ using basic gate.
   h) Write the Truth Table and Logic expression of the OR gate.

PART – B

Unit – I

2. a) List and explain characteristics of Computer.
   b) Differentiate LCD and CRT monitors. **(6+6)**

3. a) Write an algorithm and flowchart to display the maximum of three numbers.
   b) Explain the applications of Computers in different fields. **(6+6)**

P.T.O.

Unit – II

4. a) What is System Utility ? Explain any five functions of System Utility.

   b) Write a note on :

      i) Word Processors

      ii) Spreadsheet Software **(6+6)**

5. a) Briefly explain different phases of the Program Development Cycle.

   b) Define Operating System. List and explain basic functions of an Operating System. **(6+6)**

Unit – III

6. a) State and prove any two theorems of Boolean algebra.

   b) Perform the subtractions 272 – 354 using 9's and 10's Complement Methods. **(6+6)**

7. a) State and prove distributive law using truth table.

   b) Using Boolean Theorems and postulates, prove $x'y'z + x'yz + xy' = x'z + xy'$

   c) Perform the following subtraction using 1's complement method.

   $(101011)_2 - (111001)_2$. **(4+4+4)**

Unit – IV

8. a) Express the Boolean function $F(A, B, C) = A + B'C$ as sum of minterms and product of maxterms.

   b) Solve the expression $F(A, B, C, D) = \sum(0, 2, 8, 10, 14) + \sum d(5, 15)$ using K-Maps and draw the logic diagram for minimized expression. **(6+6)**

9. a) Simplify the SOP expression $F(A, B, C, D) = \sum(0, 2, 3, 5, 7, 8, 9, 10, 11, 13, 15)$ using K-Maps. Draw the logic diagram for the minimized expression.

   b) What are universal gates ? Prove that NAND is universal gate. **(6+6)**

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BCACACN 201

Second Semester B.C.A. Degree Examination, July/August 2023
(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) Represent the following using Venn diagram.
   i) $A \cup B$ ii) $A \cap B$

   b) Express the statement through appropriate symbols :

   It is not raining still it is pleasant.

   c) Let x = {1,5,p,Jack}, Y = {2,5,7,q,Jill} and f={(1,2), (5,7), (p,q), (Jack, q)}. Find D_f and R_f.

   d) How many ways are there to select 5 players from a 10-member tennis team to make a trip to a match at another college ?

   e) What is the probability that when two dice are rolled, the sum of the numbers on the two dice is 7 ?

   f) What are the quotient and remainder when 101 is divided by 11 ?

   g) How many edges are there in a graph with 10 vertices each of degree 6 ?

   h) Define root node and leaf node.

P.T.O.

PART – B

Unit – I

2. a) Write which of these is a tautology or a fallacy with the help of truth table.

   i) $p \vee \neg(p \wedge q)$ ii) $(p \wedge q) \wedge \neg(p \wedge q)$

   b) $A = \{1, 2, 3\}$, $B = \{1, 2, 5, 7, 9\}$. Write $A + B$, $A \cup B$ and $A \cap B$.

   c) Let $X = \{1, 2, 3, \ldots, 7\}$ and $R = \{(x, y) \mid x - y \text{ is divisible by } 3\}$. Show that R is an equivalence relation. **(4+4+4)**

3. a) Show the following implications :

   i) $(p \wedge q) \Rightarrow (p \rightarrow q)$ ii) $p \Rightarrow (q \rightarrow p)$

   b) $A = \{\alpha, \beta\}$ and $B = \{1, 2, 3\}$. Find A^2, B^2, $A \times B$ and $B \times A$.

   c) $R = \{(1, 2), (3, 4), (2, 2)\}$, $S = \{(4, 2), (2, 5), (3, 1), (1, 3)\}$. Write $R \circ S$, $R \circ R$, $S \circ S$ and $S \circ R$. **(4+4+4)**

Unit – II

4. a) Draw the Hasse diagram of the set A, under the partial ordering relation "divides" and indicate whether it is totally ordered. $A = \{1, 2, 3, 6, 12\}$.

   b) 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 $f \circ g$, $g \circ f$, $h \circ s$ and $f \circ s$.

   c) How many bit strings of length eight, either start with a 1 bit or end with two bits 00 ? **(4+4+4)**

5. a) Define Surjective and Bijective functions with example.

   b) There are 18 mathematics majors and 325 computer science majors at a college. In how many ways can two representatives be picked so that one is a mathematics major and the other is a computer science major ?

   c) A group of 30 people have been trained as astronauts to go on the first mission to Mars. How many ways are there to select a crew of six people to go on this mission (assuming that all crew members have the same job) ? **(4+4+4)**

Unit – III

6. a) What is the probability that a positive integer selected at random from the set of positive integers not exceeding 100 is divisible by either 2 or 5 ?

   b) What is the expected value of the sum of the numbers that appear when a pair of fair dice is rolled ?

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

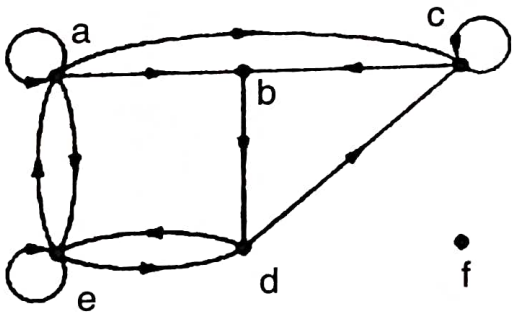
7. a) A sequence of 10 bits is randomly generated. What is the probability that at least one of these bits is 0 ?

   b) Find the prime factorization of 7007.

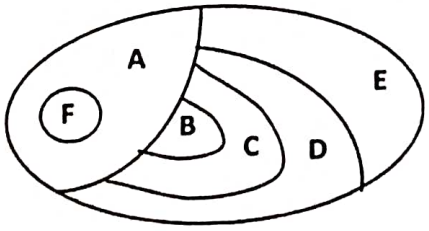
   c) Use mathematical induction to prove the inequality $n < 2^n$ for all positive integers n. **(4+4+4)**

Unit – IV

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



   b) Construct the dual graph for the given map. Find the number of colors needed to color the map so that no two adjacent regions have the same color. **(6+6)**



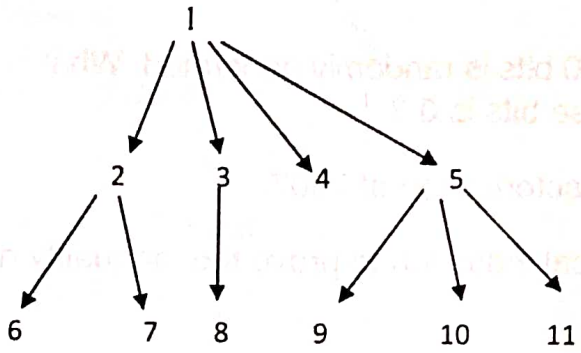
9. a) Define the following with example :

i) Binary tree

ii) Pendent node

iii) Multigraph.

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



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BCACACN 203

Second Semester B.C.A. Degree Examination, July/August 2023
(NEP 2020) (2021-22 Batch Onwards)
OBJECT ORIENTED CONCEPTS USING JAVA (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) Mention any four advantages of OOP.
   b) What is type conversion ? Mention the types.
   c) What is the purpose of break and continue statement ? Give example.
   d) What is the use of 'this' keyword in Java ?
   e) What is the purpose of super() ?
   f) List any four types of exceptions in Java.
   g) List any two features of applets.
   h) What is an event ? Give example.

PART – B

UNIT – I

2. a) List and explain any four features of Java.
   b) What are streams ? List and explain different byte and character streams.
   c) Explain the increment, decrement and conditional operator with syntax and example. **(4+4+4)**

3. a) Explain switch statement with syntax and example.
   b) Explain various features of OOP.
   c) List and explain different primitive data types available in Java. **(4+4+4)**

P.T.O.

UNIT – II

4. a) Explain different methods to initialize an array with suitable example.
   b) Write the general form of a class. Explain how to define a class in Java with suitable example.
   c) What is recursion ? Illustrate recursion with a code example. **(4+4+4)**

5. a) Explain method overloading with suitable example.
   b) Explain while loop with syntax and example.
   c) Explain command line arguments in Java with example. **(4+4+4)**

UNIT – III

6. a) Explain single inheritance with suitable example.
   b) Explain any four thread methods.
   c) Explain how to create and implement interface using suitable example. **(4+4+4)**

7. a) Explain how to create and use a package in Java with suitable example.
   b) Explain exception handling in Java with suitable example.
   c) Explain the process of creating a thread by extending a thread class. **(4+4+4)**

UNIT – IV

8. a) Explain any four methods defined in Applet.
   b) Explain how any two mouse events are handled in Applets with suitable example.
   c) Write a note on Swing Components and containers. **(4+4+4)**

9. a) List and explain any three Event Listener Interfaces.
   b) Explain the purpose of JButton with an example.
   c) Explain how any two key events are handled in applets with suitable example. **(4+4+4)**

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

BCACACN 201

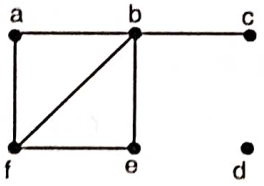
Second Semester B.C.A. Degree Examination, September 2022
(NEP – 2020) (2021-22 Batch Onwards)
DISCRETE MATHEMATICAL STRUCTURES (DSCC)

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 ?

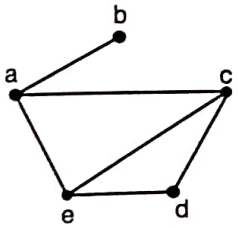
   c) Find the greatest common divisor of 414 and 662 using the Euclidean algorithm. **(4+4+4)**

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 ?

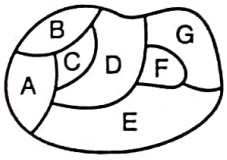
   b) Use mathematical induction to prove that $2n < n!$ for every integer n with $n \geq 4$. **(6+6)**

UNIT – IV

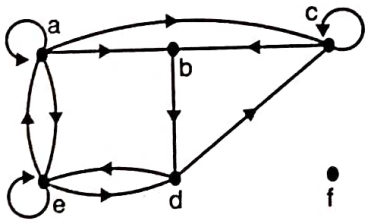
8. a) Write adjacency list and adjacency matrix to describe the simple graph given in the figure.



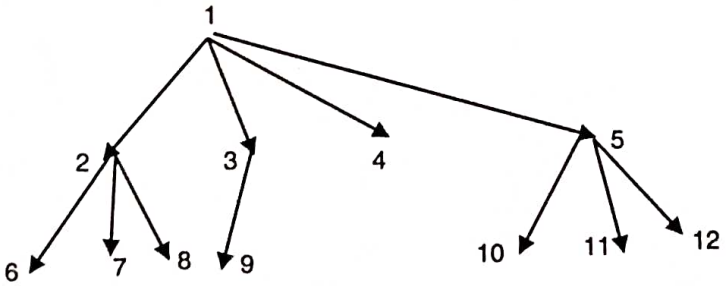
   b) Construct the dual graph for the given map. **(6+6)**



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)**



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BCACACN 203

Second Semester B.C.A. Degree Examination, September 2022
(NEP-2020) (2021 – 22 Batch Onwards)
OBJECT ORIENTED CONCEPTS USING JAVA (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) Define the terms :
   i) Data Encapsulation
   ii) Data Abstraction.
   b) What is stream ? List different types of streams in Java.
   c) What is vector ? How it is different from array ?
   d) What are constructors ? Mention types of constructors in Java.
   e) What is the purpose of keyword super and super () ?
   f) List any four API packages of Java.
   g) Give the syntax of Applet tag.
   h) List the two key features of a swing GUI.

PART – B

Unit – I

2. a) Explain various features of OOP.
   b) List and explain different primitive data types available in Java. **(6+6)**

3. a) Explain any 6 features of Java.
   b) Explain the increment, decrement and conditional operator with syntax and example. **(6+6)**

P.T.O.

Unit – II

4. a) Explain for loop with syntax and example.
   b) What are arrays ? Explain how to declare instantiate initialize and use a one-dimensional array with suitable code example.
   c) Write the general form of a class. Explain how to define a class in Java with suitable example. **(4+5+3)**

5. a) Explain any two string methods in Java with suitable example.
   b) Explain method overloading with suitable example.
   c) Explain do while loop with syntax and example. **(4+5+3)**

Unit – III

6. a) What is inheritance ? Explain multi-level inheritance with suitable example.
   b) Explain the life cycle of a Thread with diagram. **(6+6)**

7. a) Explain how to create and implement interface using suitable example.
   b) Explain exception handling using try/catch with suitable example. **(6+6)**

Unit – IV

8. a) List and explain any 6 methods defined by Applet.
   b) Explain how any two Mouse events are handled in java with suitable example. **(6+6)**

9. a) List and explain the components of Delegation Event Model.
   b) Explain following swing components with any two methods associated with it.
      i) JTextField
      ii) Jlist
      iii) JRadioButton. **(6+6)**