Discrete Structure and Theory of Logic
Previous Year Question Paper
B.Tech. (CSE/AIML) Semester - III

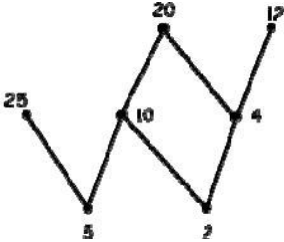## 2020-21:

Q No.	Question	Marks
1	Check whether the function $f(x) = x^2 - 1$ is injective or not for $f : R \rightarrow R$.	2
2	Let R be a relation on set A with cardinality n. Write down the number of reflexive and symmetric relation on set A.	2
3	Let A = {1, 2, 3, 4, 6, 8, 9, 12, 18, 24} be ordered by the relation „a divides b". Find the Hasse diagram.	2
4	If L be a lattice, then for every a and b in L prove that $a \wedge b = a$ if and only if $a \leq b$.	2
5	If $f : R \rightarrow R$, $g : R \rightarrow R$ and $h : R \rightarrow R$ defined by $f(x) = 3x^2 +2$, $g(x) = 7x - 5$ and $h(x) = 1/x$. Compute the following composition functions i. (fogoh)(x) ii. (gog)(x) iii. (goh)(x) iv. (hogof)(x)	10
6	Prove that in any lattice the following distributive inequalities hold i. $a \wedge (b \vee c) \geq (a \wedge b) \vee (a \wedge c)$ ii. $a \vee (b \wedge c) \leq (a \vee b) \wedge (a \vee c)$	10
7	Simplify the Boolean function F (A, B, C, D) = $\sum$ (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11) Also draw the logic circuit of simplified F.	10
8	Simplify the following Boolean expressions using Boolean algebra i. $xy + x'z +yz$ ii. C(B+C)(A+B+C) iii. A+B(A+B)+A(A'+B) iv. $XY + (XZ)' + XY'Z(XY + Z)$	10
9	Define tautology, contradiction and contingency? Check whether $(p \vee q) \wedge (\sim p \vee r) \rightarrow (q \vee r)$ is a tautology, contradiction or contingency.	10

2021-22:

Q No.	Question	Marks
1	Let A = {1,2,3,4,5,6} be the set and R = {(1,1) (1,5) (2,2) (2,3) (2,6) (3,2) (3,3,) (3,6) (4,4) (5,1) (5,5) (6,2) (6,3) (6,6)} be the relation defined on set A. Find Equivalence classes induced by R.	2
2	Differentiate complemented lattice and distributed lattice.	2
3	State De Morgan"s law and Absorption Law.	2
4	Justify that for any sets A, B, and C: i) $(A - (A \cap B)) = A - B$ ii) $(A - (B \cap C)) = (A - B) \cup (A - C)$	10

5	Solve $E(x,y,z,t) = \sum (0,2,6,8,10,12,14,15)$ using K-map.	10
6	Construct the truth table for the following statements: i) $(P \rightarrow Q'') \rightarrow P''$ ii) $P \leftrightarrow (P'' \vee Q'')$.	10
7	State Principle of Duality. Let A denote the set of real numbers and a relation R is defined on A such that $(a,b)R(c,d)$ if and only if $a^2 + b^2 = c^2 + d^2$. Justify that R is an equivalence relation.	10
8	i) Let $R = \{(1,2) (2,3) (3,1)\}$ defined on $A = \{1,2,3\}$. Find the transitive closure of R using Warshall''s algorithm. ii) Justify that "If f: A→B and g: B→C be one-to-one onto functions, then gof is also one to one onto and $(gof)^{-1} = f^{-1} o g^{-1}$".	10
9	Define Modular Lattice. Justify that if „a" and „b" are the elements in a bounded distributive lattice and if „a" has complement a′. then I) $a \vee (a' \wedge b) = a \vee b$ II) $a \wedge (a' \vee b) = a \wedge b$	10
10	i) Justify that $(D_{36},\backslash)$ is lattice. ii) Let L_1 be the lattice defined as D_6 and L_2 be the lattice $(P(S), \leq)$, where $P(S)$ be the power set defined on set $S = \{a, b\}$. Justify that the two lattices are isomorphic.	10

2022-23:

Q No.	Question	Marks
1	Identify whether $\lceil x+y \rceil = \lceil x \rceil + \lceil y \rceil$, $\forall x,y \in R$, where $\lceil x \rceil$ is a ceiling function	2
2	Find the Maximal elements and minimal elements form the following Hasse''s diagram 	2
3	Define what is Big-O notation with respect of growth of functions.	2
4	Find the composite mapping **gof** if f: R $\rightarrow$ R is given by $\mathbf{f(x) = e^x}$ and g: R $\rightarrow$ R is given by $\mathbf{g(x) = sinx}$	2
5	Let $\mathbf{A = \{ \Phi, b\}}$, then calculate $\mathbf{A \cup P(A)}$, where P(A) is a power set of A.	2
6	Draw the Hasse''s diagram of the POSET $(L, \subseteq)$, where $L = \{S_0, S_1, S_2, S_3, S_4, S_5, S_6, S_7\}$, where the sets are given by $S_0 = \{a,b,c,d,e,f\}$, $S_1 = \{a,b,c,d,e\}$, $S_2 = \{a,b,c,e,f\}$, $S_3 = \{a,b,c,e\}$, $S_4 = \{a,b,c\}$, $S_5 = \{a,b\}$, $S_6 = \{a,c\}$, $S_7 = \{a\}$	2
7	Identify whether $\mathbf{(p \wedge q) \rightarrow (p \vee q)}$ is tautology or contradiction with using Truth table.	2
8	Identify whether the each of the following relations defined on the set $X = \{1,2,3,4\}$ are reflexive, symmetric, transitive and/or antisymmetric? *(i)* $\boldsymbol{R_1} = \{ (1,1), (1,2), (2,1) \}$ *(ii)* $\boldsymbol{R_2} = \{ (1,1), (1,2), (1,4), (2,1), (2,2), (3,3), (4,1), (4,4) \}$ *(iii)* $\boldsymbol{R_3} = \{ (2,1), (3,1), (3,2), (4,1), (4,2), (4,3) \}$	10

9	Let a function is defined as **f: R-{3}→ R-{1}, f(x) = (x-1)/(x-3)** , then **show** that f is a bijective function and also compute the inverse of f. Where R is a set of real numbers.	10
10	**(i)** Express Converse, Inverse and Contrapositive of the following statement **"If x+5=8 then x=3"** (ii) Show that the statements P↔Q and (P∧Q) V(⌐P∧⌐Q) are equivalent	10
11	Define complemented lattice and then show that in a distributive lattice, if an element has a complement then this complement is unique.	10
12	Solve the following Boolean functions using K-map: (i) **F(A,B,C,D) = ∑(m_0, m_1, m_2, m_4, m_5, m_6, m_8, m_9, m_{12}, m_{13}, m_{14})** (ii)**F(A,B,C,D)=∑(0,2,5,7,8,10,13,15)**	10
13	Define Boolean algebra. **Show** that **a'.[(b'+c)'+ b.c] + [(a+b')'.c] = a'.b** using rules of Boolean Algebra. Where **a'** is the complement of an element **a**.	10

Technical Communication
Previous Year Question Paper
B.Tech. (CSE/AIML) Semester – III

1. Describe the features of Technical Communication.
2. What are the 7 Cs of Communication ?
3. Discuss Interpersonal Barriers in Communication. Suggest ways to overcome it.
4. Give 2 Differences between General and Technical Communication.
5. What are Vowel Sounds and Consonant Sounds?
6. Write a short on Intonation.
7. What is Code and Content of Communication Skills?
8. Analyze factors to be emphasized upon while preparing for interviews (2021-22).
9. Evaluate steps involved in carrying out the process of communication (2021-22).
10. State different types of resumes. Infosys invites application for the position of executive engineer, draft a resume to submit for the same with necessary details (2021-22).
11. Explain the differences between a resume and a CV.
12. Write a short note on GD.
13. What are the steps involved in writing a personal profile for a CV?
14. What is communication for networking?
15. What is importance and purpose of drafting Technical Proposal?

CYBER SECURITY BCC301
Previous Year Question Paper
B.Tech. (CSE/AIML) Semester – III

UNIT 1

1. (a) What is Cybercrime? Who are Cybercriminal? Explain?

(b) Classify Cybercrimes? Explain with examples?

2. (a) Explain about legal perspectives of Cybercrimes? (

b) Explain about Indian perspectives of Cybercrimes?

3. (a) Discuss about Cybercrime and the Indian ITA 2000?

(b) Explain different types of Cybercrimes and how security will provide?

4. How the Criminals Plan the Attacks? Explain with examples?

5. Explain about the impact of Cybercrimes in Social Engineering?

6. (a) What if Cyber Offenses? Discuss?

(b) Write about Cyber café and Cybercrimes?

7. (a) What are Botnets? Explain.

(b) How Botnets Involved in Cybercrimes?

8. (a) Write about the Fuel for Cybercrimes?

(b) Discuss about the Attack Vector?

9. What is Cloud Computing? Explain all the Services provided by Cloud Computing?

10. How Cybercriminal attacking Cloud Services? Explain with examples?

UNIT 2

1. (a) What is Proliferation of Mobile and Wireless Devices? Explain

 (b) What are different trends in Mobility?

2. (a) Discuss about the Cybercrime activities in Mobile Devices?

(b) Write about the Cybercrime activities in Wireless Devices?

3. (a) What are different trends in Wireless devices?

(b) Explain about Credit card frauds in Mobile and Wireless Computing era?

4. What are different security challenges posed by mobile devices? Explain?

5. What are different Registry Settings for Mobile Devices? Explain?

6. (a) Discuss about Authentication Service Security?

(b) Write about Mobile/Cell Phone attacks?

7. (a) Discuss about the Security implications for Organizations?

(b) What different Organizational measures for handling Mobile?

8. (a) Explain about the Organizational Security policies for mobile devices?

(b) What are different security policies on measures in Mobile devices?

9. What are different Security policies on Laptops and Wireless devices? Explain?

10. Explain about different Cyber Security aspects of Mobile and Wireless Devices?

Digital Electronics
Previous Year Question Paper
B.Tech. (CSE/AIML) Semester – III

UNIT 1
(2022-23)
Short Answer Type Questions

(a) Interpret the binary number $(1011)_2$ into (i) Gray code (ii) Excess-3 Code.

(b) Evaluate $(1011)_2$ - $(1101)_2$ using 1's and 2's complement method.

(c) Explain the signed binary number.

(d) Define the term universal gates and their applications.

Long Answer Type Questions

(a) Implement the Boolean function $F (x, y, z) = (1,2,3,4,6,7)$ using NAND gates.

(b) Simplify $Y=\sum m (3,6,7,8,10,12,14) + d (0,1,6,15)$ using K-map method and implement the simplified circuit using logic gates.

(c) Minimize the following Boolean function using tabulation method:

$F (a, b, c, d, e) = \sum m (0,4,12,16,19,24,27,28,29,31)$

Convert the following,

1. $(5162)10 = ()2$
2. $(11011001)2 = ()10$
3. $(6273)10 = ()8$
4. $(7860)10 = ()16$
5. $(A23B8)16 = ()10$

(d) Design an XOR gate by using NAND gate implementation.

(e) Define the De-morgans theorem of Logic Simplification for SOP & POS forms.

(2021-22)
Short Answer Type Questions

(a) Define the term binary codes with an example.
(b) Differentiate between SOP & POS form.
(c) How are binary digits used to express the integer and fractional parts of a number?
(d) Explain how BCD addition is carried out

Long Answer Type Questions

(a) Explain the implementation of an X-OR gate with NAND implementation.
(b) Explain different steps associated to Quine McClusky (Tabular Method) of minimizing Boolean Functions.
(c) Minimize the following Boolean function using K Map
$$f(A, B, C, D) = \Sigma m(0, 1, 4, 8, 9, 10) + \Sigma d(2, 11)$$

(d) Realize a 3-input gate using 2-input gates for the following gates:

AND (ii) OR (iii) NAND (iv) NOR
(e) Minimize the following using Tabular method

$F(A, B,C,D,E) = \sum m(0,1,2,3,6,7,14,15,16,19,31)$
(f) (i) Reduce the expression $f = \sum m (0,1,2,3,5,7,8,9,10,12,13)$ using K-maps and implement the real minimal expression using NAND logic.
(ii) Design the logic circuit for a BCD to decimal decoder.

UNIT 2

(2022-23)
Short Answer Type Questions
(a) Differentiate between the serial and parallel adder.

(b) How many 4 X 1 multiplexers are required to implement 64 X 1 multiplexer.

(c) Elaborate the term Combinational Circuits.

(d) Define BCD codes and convert (A5D8)16 into BCD number.

Long Answer Type Questions
(a) Construct a full adder and implement the full adder with the help of half adders. Also implement the full adder with NAND gates only.

(b) Design a BCD adder using 4-bit parallel adder.

(c) Draw and Explain 2-bit magnitude comparator. Also represent output with the help of logic diagram.

(d) Design 4:1 multiplexer using gates.

(e) Design a 4-bit adder circuit using gates.

(f) Design a 3:8 Decoder circuit using gates.

(2021-22)
Short Answer Type Questions
(a) Define the term combinational logic with an example.

(b) Discuss universal gates.
(c) Implement a 4:1 multiplexer using 2:1 multiplexer.
(d) Demultiplexer is decoder circuit with an additional enabling input. Do you agree with the above statement?

Long Answer Type Questions
(a) Illustrate the working of Serial and parallel adders and differentiate theoperations.

(b) Design a 4-bit magnitude comparator

(c) Design a full adder and full subtractor using NAND gates only.

(d) (i)Implement a full subtractor circuit using only NAND gates.

(ii)Using 4:1 multiplexer, implement the following function

a. F (A, B, C) =$\sum$ m (0,2,3,5,7)

(e) Construct BCD adder using two 4-bit binary parallel adder and logic gates.

(f) Explain 4-bit magnitude comparator.

UNIT 3
(2022-23, IV Sem, KOE 049)
Short Answer Type Questions

(a) What is the difference between characteristic and excitation table.

(b) Differentiate between combinational and sequential circuits.

(c) Explain the term storage elements.

(d) Illustrate the term sequential logic.

Long Answer Type Questions

(a) Discuss excitation table for SR, JK, T and D flip flop.

(b) Design and implement MOD-10 synchronous counter.

(c) For the clocked JK Flip-Flop write the state table, state equation with state diagram.

(d) Elaborate the characteristic equations of S-R and J-K Flip-Flops.

(e) Elaborate the working and circuit of a Serial-in-Serial-Out shift register.

(f) Explain the working and circuit of a modulo-5 counter using gates.

(2021-22, IV Sem, KOE 049)
Short Answer Type Questions

(a) Explain the term Latch.

(b) Explain the term registers.

(c) Give the difference between positive and negative edge triggering.

(d) A flip-flop has 5 ns delay from the time the clock edge occurs to the time the output is complemented. What is the maximum delay in a 10-bit binary ripple counter that uses these flip-flops? What is the maximum frequency the counter can operate reliably?

Long Answer Type Questions

(a) Explain the working of J-K Flip-Flop.

(b) Describe the Design of J-K FF using T FF.

(c) Describe the operations and applications of a Serial-in Parallel-out Shift Register with a neat diagram.

(d) Define bi-directional shift register. Draw and explain 3- bit bi-directional shift register using D flip-flop.

(e) Design a 3-bit UP/DOWN counter with a direction control M, using JK flip-flops.

(f) A sequential circuit has one flip-flop Q, two inputs x and y, and one output S. It consists of a full-adder circuit connected to a D flip-flop, as shown in given figure. Derive the state table and state diagram of the sequential circuit. What does this circuit represent?

Data Structure
Previous Year Question Paper
B.Tech. (CSE/AIML) Semester – III

2022-23
SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

   (a) Define best case, average case and worst case for analyzing the complexity of a program.

   (b) Differentiate between binary search tree and a heap.

   (c) Write the condition for empty and full circular queue.

   (d) What do you understand by tail recursion?

   (e) What are the advantages and disadvantages of array over linked list?

   (f) Which data structure is used to perform recursion and why?

SECTION B

2. Attempt any three of the following: 10x3=30

(a) Assume that the declaration of multi-dimensional arrays X and Y to be, X (-2:2, 2:22) and Y (1:8, -5:5, -10:5)

 (i) Find the length of each dimension and number of elements in X and Y.

(ii) Find the address of element Y (2, 2, 3), assuming Base address of Y = 400 and each element occupies 4 memory locations.

(b) What is Stack? Write a C program for linked list implementation of stack.

 3. (a) How to represent the polynomial using linked list ? Write a C program to add two polynomials using linked list.

 (b) Discuss doubly linked list. Write an algorithm to insert a node after a given node in singly linked list.

4. Attempt any one part of the following: 10x1=10

(a) Write an algorithm for converting infix expression into postfix expression. Trace your algorithm for infix expression Q into its equivalent postfix expression P, Q: A + (B * C – (D / E ^ F) * G) * H

 (b) What is circular Queue? Write a C code to insert an element in circular queue?

SECTION A

1. . Attempt all questions in brief.　　2 x 10

(a) Convert the infix expression (A+B) *(C-D) $E*F to postfix. Give the answer without any spaces.

(b) Rank the following typical bounds in increasing order of growth rate: O(log n), O(n4), O(1), O(n2 log n)

(c) What does the following recursive function do for a given Linked List with first node as head?

```
void fun1(struct node* head)
{
        if(head == NULL)
            return;
        fun1(head->next);
        printf("%d ", head->data);
}
```

(d) Define a sparse matrix. Suggest a space efficient representation for space matrices.

(e) List the advantages of doubly linked list over single linked list.

(f) What is tail recursion? Explain with a suitable example.

SECTION B

2. Attempt any three of the following: 10X3 = 30

 (a) Write advantages and disadvantages of linked list over arrays. Write a 'C' function creating new linear linked list by selecting alternate elements of a linear linked list.

(b) Differentiate between liner and binary search algorithm. Write a recursive function to implement binary search.

 3.

(a) Suppose a three dimensional array A is declared using A[1:10, -5:5, -10:5)

(i) Find the length of each dimension and the number of elements in A

 (ii) Explain Row major order and Column Major Order in detail with explanation formula expression.

(b) Discuss the representation of polynomial of single variable using linked list. Write 'C' functions to add two such polynomials represented by linked list.

4. (a) Discuss disadvantages of recursion with some suitable example.

 (b) (i) What is Recursion?

(ii)Write a C program to calculate factorial of number using recursive and nonrecursive

functions.

2020-21
SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

a. Define Time-Space trade-off.

b. Differentiate Array and Linked list.

c. Explain Tail Recursion with suitable example.

d. Write the full and empty condition for a circular queue data structure.

f. Differentiate sequential search and binary search.

SECTION B

2. Attempt any three of the following
 (a) Consider a multi-dimensional Array A[90] [30] [40] with base address starts at 1000.

Calculate the address of A[10] [20] [30] in row major order and column major order.

Assume the first element is stored at A[2][2][2] and each element take 2 byte.

 (b) Evaluate the following postfix expression using stack. 2 3 9 * + 2 3 ^ - 6 2 / + , show the

contents of each and every steps. also find the equivalent prefix form of above expression.

Where ^ is an exponent operator.

 (c) If the in order of a binary tree is B,I,D,A,C,G,E,H,F and its post order is I,D,B,G,C H,F,E,A

then draw a corresponding binary tree with neat and clear steps from above assumption.

 (d) Write a C program to insert a node at kth position in single linked list.

 (e) Convert the following infix expression to reverse polish notation expression using stack.

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

 (f) Write a C program to implement stack using single linked list.

 (g) Write a C program for Index Sequential Search.