

Total No. of Questions: 6

Total No. of Printed Pages: 3

Enrollment No. ENR1CS703039.....



Faculty of Engineering / Science

End Sem (Odd) Examination Dec-2022

BC3BS05 / CS3BS04 / IT3BS01 Discrete Mathematics

Programme: B.Tech.

Branch/Specialisation: CSE / IT /

/ B.Sc.

Computer Science

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1**
- i. The trivial subset of set $X = \{a, b, c\}$ is 1
 (a) X (b) $\{\emptyset, X\}$ (c) $\{\emptyset\}$ (d) None of these
 - ii. Let A and B be two disjoint sets then $|A \cup B|$ - 1
 (a) $|A \cup B| = |A| + |B|$ (b) $|A \cup B| = |A| - |B|$
 (c) $|A \cup B| = |A||B|$ (d) None of these
 - iii. If $f: X \rightarrow Y$ and A, B are two subsets of Y then- 1
 (a) $f^{-1}(A \cup B) = f^{-1}(A) \cup f^{-1}(B)$
 (b) $f^{-1}(A \cup B) = f^{-1}(A) \cap f^{-1}(B)$
 (c) $f^{-1}(A \cap B) = f^{-1}(A) \cup f^{-1}(B)$
 (d) None of these
 - iv. The number of maximal elements in the set $\{1, 2, 3, 4, 5\}$ under relation divisibility is- 1
 (a) 2 (b) n (c) 3 (d) None of these
 - v. In group $G = \{1, -1, i, -i\}$ order of element i with respect to multiplication is- 1
 (a) 1 (b) 2 (c) 4 (d) None of these
 - vi. Let I be a set of integers under addition operation H is subgroup of even integers then elements in coset of H in G is- 1
 (a) $\{0, \pm 1, \pm 2, \dots\}$
 (b) $\{1, 2, 3, \dots\}$
 (c) $\{0, \pm 1, \pm 2, \dots\}$ and $\{1, 2, 3, \dots\}$
 (d) None of these

- vii. Which is planar graph? 1
 (a) K_4 (b) K_5 (c) K_6 (d) None of these
- viii. The degree of pendant vertex is- 1
 (a) 1 (b) 0 (c) 3 (d) 2
- ix. The homogeneous solution of $a_r + Aa_{r-1} + Ba_{r-2} = 0$, when roots of axillary equation are real and distinct- 1
 (a) $c_1 m_1^r + c_2 m_2^r$ (b) $(c_1 + rc_2)m^r$
 (c) $c_1 e^{m_1} + c_2 e^{m_2}$ (d) None of these
- x. In recurrence relation generating function of sequence $\{y_n\}$ is given by- 1
 (a) $\sum_{h=0}^n y_h t^h$ (b) $\sum_{h=0}^{\infty} y_h t^h$
 (c) $\sum_{h=0}^n y_{h+1} t^{h+1}$ (d) $\sum_{h=0}^{n-1} y_h t^h$
- Q.2**
 Attempt any two:
 i. Define reflexive, symmetric and transitive relation. With example. 5
 ii. How many solutions does equation $x_1+x_2+x_3+x_4=13$ have where x_1, x_2, x_3 are non-negative integers with $0 \leq x_i \leq 5$, $i=1,2,3,4$ 5
 iii. Show that if 5 points are selected in a square whose sides have length 1 inch, at least two of the points must be no more than $\sqrt{2}$ inches apart. 5
- Q.3**
 Attempt any two:
 i. Let B be the set of all positive divisors of 30 i.e $B = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and the operations + and * on B are defined as $a+b = L.C.M. of a and b$, $a*b = H.C.F. of a and b$, $a' = 30/a$. Prove that $(B, +, *, ')$ is Boolean Algebra. 5
 ii. Show that the relation "divides" on N is a partial order relation. 5
 iii. Change the Boolean function into disjunctive normal form
 $f(x, y, z) = [x + (x'+y)'] \cdot [x + (y'z')']$ 5
- Q.4**
 Attempt any two:
 i. If H_1 and H_2 are two subgroups of a group (G, \circ) , then $H_1 \cap H_2$ is also a subgroup of G but union of two subgroups is not necessarily a subgroup explain with an example. 5
 ii. Find all generators in the cyclic group $\{1, 2, 3, 4, 5, 6\}$ under multiplication modulo 7. 5

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- iii. Prove that every cyclic group is abelian group.

5

Q.5

Attempt any two:

- i. Define following with example:

5

(a) Graph colouring and chromatic number

(b) Vertex disjoint subgraph

- ii. Prove that number of edges in a tree with n vertices is $n-1$.

5

- iii. If the number of vertices in a graph is 10 each of degree 3. Find number of edges and number of regions in the graph.

5

Q.6

Attempt any two:

- i. Solve the recurrence relation $a_r + 5a_{r-1} + 5a_{r-2} = 2 + r$

5

- ii. Find numeric function of generating function:

5

$$A(z) = (1+z)^n + (1-z)^n$$

- iii. There are 10 students in the class, of which 8 are girls and 2 are boys. Find the number of ways to select:

5

(a) 2 girls and 1 boy

(b) 1 girl and 2 boys

Total No. of Questions: 6

Total No. of Printed Pages: 3



Enrollment No. EN21CL304039

Faculty of Engineering / Science
End Sem (Odd) Examination Dec-2022
CS3CO31 / IT3CO02 / BC3CO36 Data Structures

Programme: B.Tech.
/ B.Sc.(CS)

Branch/Specialisation: CSE All / IT /
Computer Science

Maximum Marks: 60

Duration: 3 Hrs.

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. Which of the following is not true about abstract data type (ADT): 1
(a) An abstract data type is a mathematical model
(b) Abstract data types are generalizations of primitive data types
(c) ADT's specification depends upon implementation
(d) ADT's specification is independent of any particular implementation
- ii. Any problem which is implemented with recursion can be 1 implemented with:
(a) Switch case (b) Loop (c) If-else (d) If elif else
- iii. Which of the following operations is performed more efficiently by 1 doubly linked list than by singly linked list?
(a) Deleting a node whose location is given
(b) Searching of an unsorted list for a given item
(c) Inserting a node after the node with given location
(d) Traversing a list to process each node
- iv. A variant of the linked list in which none of the node contains NULL 1 pointer is-
(a) Singly linked list (b) Doubly linked list
(c) Circular linked list (d) None of these
- v. Consider the following sequence of operations on an empty stack. 1
push(31)
push(65)
pop()
push(25)
push(22)
 $X = \text{pop}()$

P.T.O.

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Consider the following sequence of operations on an empty queue.

enqueue(90)

enqueue(14)

dequeue()

enqueue(21)

enqueue(77)

$Y = \text{dequeue}()$

The value of $X + Y$ is _____. 1

- (a) 38 (b) 36 (c) 99 (d) 112

vi. The following postfix expression with single digit operands is evaluated using a stack: $16\ 2\ 4\ ^\wedge\ / 3\ 4\ *\ + 7\ 9\ *\ -$ note that $^\wedge$ is the exponentiation operator. The top two elements of the stack after the first * is evaluated are:

- (a) 5, 7 (b) 12, 1
(c) 16, 2 (d) 5, 1

vii. Which one of the following in place sorting algorithms needs the minimum number of swaps? 1

- (a) Insertion sort (b) Bubble sort
(c) Selection Sort (d) Quick sort

viii. Which one of the following sorting algorithms sort the following array by using minimum number of comparisons? 1

23	37	53	59	64	72	89	94	156	197
----	----	----	----	----	----	----	----	-----	-----

- (a) Insertion sort (b) Bubble sort
(c) Selection Sort (d) Quick sort

x. The postorder traversal of a binary tree is 8, 9, 6, 7, 4, 5, 2, 3, 1. The inorder traversal of the same tree is 8, 6, 9, 4, 7, 2, 5, 1, 3. The height of a tree is the length of the longest path from the root to any leaf. The height of the binary tree above is- 1

- (a) 2 (b) 3 (c) 4 (d) 5

x. Most suitable data structure for breadth first search (BFS) implementation is- 1

- (a) Stack (b) Queue (c) Linked list (d) Tree

Q.2 i. What do you understand by data structure? Give a real-life example where it can be used. 7

Remaind

- Q.4 i. What do you understand by 'stack underflow' condition? Write a C statement to detect it.
- ii. Write down some disadvantages of simple queue. How can it be overcome?
- OR iii. Write an algorithm to convert postfix expression into infix expression. Demonstrate algorithm by evaluating postfix expression: $3\ 5\ *\ 6\ 2\ / \ + ?$

- Q.5 i. Demonstrate binary search to search a key=54 in following array:

13	37	43	54	64	82	99	124
----	----	----	----	----	----	----	-----

- ii. (a) Enumerate methods for choosing the pivot element in binary search.
(b) Compare the various hashing techniques.
- OR iii. Consider the hash table of size 10. Using quadratic probing, insert keys 72, 27, 36, 24, 63, 81, and 101 into hash table. Initial addresses are $c_1=1$ and $c_2=3$.

- Q.6 Attempt any two:

- i. Demonstrate applicability of graph data structure? Explain the various representation of graph with example?
- ii. Brief the properties of AVL trees. Explain about rotations required for insertion in AVL search tree with example.
- iii. Enumerate benefits for threaded tree. Write an algorithm for traversal in a threaded binary tree.



Faculty of Engineering / Science
End Sem (Odd) Examination Dec-2022
CS3CO28 / BC3CO39 Data Communication
Programme: B.Tech. Branch/Specialisation: CSE / Computer
/ B. Sc. Science

Duration: 3 Hrs.**Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- | | | | |
|-----|-------|---|-------------------------------|
| Q.1 | i. | Which are guided media? | 1 |
| | (a) | Radio broadcasting | (b) Cellular telephone system |
| | (c) | Satellite communications | (d) Local telephone system |
| | ii. | Bandwidth of the signal that ranges from 40Hz to 4KHz- | 1 |
| | (a) | 3.96KHz | (b) 396KHz |
| | (c) | 39.6KHz | (d) 3.96Hz |
| | iii. | Carrier signal in modulation technique is _____ signal. | 1 |
| | (a) | High frequency | (b) Low frequency |
| | (c) | High amplitude | (d) Low amplitude |
| | iv. | Which of the following is not a digital-to-analog conversion? | 1 |
| | (a) | ASK | (b) PSK |
| | (c) | FSK | (d) AM |
| | v. | A local telephone network is an example of a _____ network. | 1 |
| | (a) | Packet switched | (b) Circuit switched |
| | (c) | Bit switched | (d) Line switched |
| | vi. | Which network topology requires a central controller or hub? | 1 |
| | (a) | Star | (b) Mesh |
| | (c) | Ring | (d) Bus |
| | vii. | The network layer is concerned with _____ of data. | 1 |
| | (a) | Bits | (b) Frames |
| | (c) | Packets | (d) Bytes |
| | viii. | A 4 byte IP address consists of _____. | 1 |
| | (a) | Only network address | |
| | (b) | Only host address | |
| | (c) | Network address & host address | |
| | (d) | None of these | |
| | ix. | In cyclic redundancy checking, what is CRC? | 1 |
| | (a) | Quotient | (b) Divisor |
| | (c) | Dividend | (d) Remainder |

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- x. Calculate VRC for data 11010101 (consider odd parity generator). 1
(a) 0 (b) 1 (c) 2 (d) None of these
- Q.2 i. Write the Shannon's channel capacity and Nyquist's channel capacity formula. 2
ii. Write the definition of bandwidth, propagation time, and throughput. 3
iii. Discuss different transmission impairment in data communication. 5
OR iv. Explain different guided transmission media in detail. 5
- Q.3 i. Discuss the concept of time division multiplexing with neat diagram. 4
ii. Discuss LZ compression technique in detail with example. 6
OR iii. Encode the bit pattern 111100011001 using Manchester, Differential Manchester, NRZ-L and NRZ-I. 6
- Q.4 i. What do you understand by connection oriented and connection less services? 4
ii. Discuss various topologies with their advantages and disadvantages. 6
OR iii. Distinguish between virtual circuit packet switching and datagram packet switching technique. 6
- Q.5 i. Explain the working of network layer in OSI model. 4
ii. Explain physical addressing, logical addressing and port addressing. 6
OR iii. Explain different Internetworking devices- switch, router, gateway, bridge. 6
- Q.6 Attempt any two:
i. Explain error correction technique with suitable example. 5
ii. Explain parity checking mechanism with suitable example. 5
iii. Generate redundant bit using cyclic redundancy check algorithm when data word is 1001 and divisor is 1011. 5

Total No. of Questions: 6

Total No. of Printed Pages: 3



Enrollment No. EN21C8204039

Faculty of Engineering / Science

End Sem (Odd) Examination Dec-2022

CS3CO30 / BC3CO35 Object Oriented Programming
Programme: B.Tech. Branch/Specialisation: CSE/ Computer
/ B.Sc. Science

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. How many classes can be defined in a single program? 1
(a) Only 1 (b) Only 100
(c) Only 999 (d) As many as you want
- ii. Which language does not support single level inheritance 1
(a) C++ (b) C (c) JAVA (d) All of these
- iii. If different properties and functions of a real world entity is grouped or embedded into a single element, what is it called in OOP language? 1
(a) Inheritance (b) Polymorphism
(c) Encapsulation (d) Abstraction
- iv. What is syntax of defining a destructor of class A? 1
(a) A(){} (b) ~A(){} (c) A::A(){} (d) ~A(){};
- v. _____ is a simple structural connection or channel between classes and is a relationship where all objects have their own lifecycle and there is no owner. 1
(a) Inheritance (b) Composition
(c) Realization (d) Aggregation
- vi. A _____ connects a single class type (serving in one role) to itself (serving in another role). 1
(a) N-ary Association (b) Directed Association
(c) Recursive association (d) Association End
- vii. What will be the order of execution of base class constructors in the following method of inheritance? 1
class a: public b, public c {...};
(a) b(); c(); a(); (b) c(); b(); a();
(c) a(); b(); c(); (d) b(); a(); c();

- viii. A virtual function that has no definition within the base class is 1
 called-
- (a) Friend function (b) Pure static function
 - (c) Pure const function (d) Pure virtual function
- ix. A template class can have- 1
 (a) Only one generic data type
 (b) At most two data types
 (c) Only generic type of integers and not characters
 (d) More than one generic data type
- x. Which stream class is to only write on files? 1
 (a) ifstream (b) ofstream (c) fstream (d) iostream
- Q.2**
- i. What is OOP? Enlist applications of OOP language. 3
 - ii. What the main concepts of object-oriented programming? 7
 Explain each one of them in detail.
- OR**
- iii. Differentiate between the following- 7
 - (a) OOP & POP
 - (b) Class & Object
- Q.3**
- i. What are constructor and destructor? Explain with its syntax and usage. 3
 - ii. What are the different types of constructors? Explain them. Write a program to demonstrate constructor overloading. 7
- OR**
- iii. What are the different types of objects? Explain them. Write a program to differentiate each object based on their visibility and persistency. 7
- Q.4**
- i. Define delegation and give example also. 3
 - ii. Explain the following terms- 7
 - (a) Association and its types
 - (b) Differentiate between aggregation and composition
- OR**
- iii. Explain the following terms with an example- 7
 - (a) Types of aggregation and its properties
 - (b) Multiplicity
 - (c) Generalization
- Q.5**
- i. Explain virtual function. 3

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- ii. What is inheritance? What are the types of inheritance? Write a program to demonstrate the concept of virtual base class. 7
- OR iii. What is polymorphism? What are the types of polymorphism? Write a program to demonstrate binary operator overloading. 7
- Q.6 i. What is STD? Explain. 3
- ii. What are template classes and template functions? Write a program for template class and template function. 7
- OR iii. Define container? What is the use of container? Write a program for defining the container. 7

Total No. of Questions: 6

Total No. of Printed Pages: 2

Enrollment No. EN21CS304039



Faculty of Engineering

End Sem (Odd) Examination Dec-2022

CS3CO22 / CS3CO34 / IT3CO20

Computer System Architecture

Programme: B.Tech.

Branch/Specialisation: All

Maximum Marks: 60

Duration: 3 Hrs.

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. The ALU makes use of _____ to store the intermediate results. 1
(a) Accumulators (b) Registers (c) Heap (d) Stack
- ii. Subtraction in computers is carried out by- 1
(a) 1's complement (b) 2's complement
(c) 3's complement (d) 9's complement
- iii. Which addressing mode execute its instructions within CPU without the necessity of reference memory for operands? 1
(a) Implied mode (b) Immediate mode
(c) Direct mode (d) Register mode
- iv. Which of the following is not a function of pass-1 of an assembler? 1
(a) Generate data (b) Keep track of LC
(c) Remember literals (d) Remember values of symbols
- v. The result of subtraction using 2's complement of 1111-0010 will be 1

(a) 11101 (b) 1101 (c) 11011 (d) 1011
- vi. In Booth's multiplication algorithm, for Multiplier 1000 and 1 multiplicand = 1100 then how many numbers of cycles are required to get the correct multiplication result? 1
(a) 5 (b) 2 (c) 8 (d) 4
- vii. _____ method is used to map logical addresses of variable length into physical memory. 1
(a) Paging (b) Overlays
(c) Segmentation (d) Paging with segmentation
- viii. _____ translates/convert the logical address into the physical address. 1
(a) Translator (b) Compiler (c) MMU (d) Linker

- ix. Any condition that causes a processor to stall is called as _____. 1
- (a) Hazard (b) Page fault
 (c) System error (d) None of these
- x. _____ have been developed specifically for pipelined systems. 1
- (a) Utility software (b) Speed up utilities
 (c) Optimizing compilers (d) None of these
- Q.2**
- i. Explain the types of computers with example. 2
 - ii. Draw and explain basic functional unit of computer system. 3
 - iii. What is microoperations? Explain arithmetic, logic and shift microoperations in detail. 5
- OR**
- iv. Explain bus structure in detail and draw diagram of common bus structure. 5
- Q.3**
- i. What is memory reference instructions? 2
 - ii. Define and explain addressing modes with diagrams and examples. 8
- OR**
- iii. Explain instruction cycle using flowchart and memory reference registers. 8
- Q.4**
- i. Show addition and subtraction of two signed magnitude data with their hardware implementation. 3
 - ii. Multiply (+7) *(+12) using Booth's multiplication algorithm. 7
- OR**
- iii. Explain division algorithm with flowchart. What do you understand by divide overflow condition that arises during division? 7
- Q.5**
- i. What is the use of I/O interface? How data is transferred asynchronously? 4
 - ii. How priority interrupt is handled by CPU? Explain both Software and hardware priority interrupt. 6
- OR**
- iii. Explain associative memory with its mapping techniques. 6
- Q.6**
- Attempt any two:
- i. Explain arithmetic pipeline with flowchart and example. 5
 - ii. What is an array processor and types of array processor? 5
 - iii. Explain multiprocessor architecture and multicore architecture. 5

Total No. of Questions: 6

Total No. of Printed Pages: 3

Enrollment No. EN21C304039



Faculty of Engineering / Science

End Sem (Odd) Examination Dec-2022

CS3CO29 / CS3CO33 / EC3CO07 / IT3CO26 / BC3CO38

Digital Electronics

Programme: B.Tech./
B.Sc.(CS)

Branch/Specialisation: CS/EC/IT/
Computes Science

Maximum Marks: 60

Duration: 3 Hrs.

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

- Q.1 i. In Boolean algebra, the OR operation is performed by which 1 properties?
(a) Associative properties (b) Commutative properties
(c) Distributive properties (d) All of these
- ii. Binary number 1001 is equal to octal number- 1
(a) 13 (b) 9 (c) 10 (d) 11
- iii. Decimal number 7 in Gray code is- 1
(a) 1100 (b) 0101 (c) 0100 (d) 0111
- iv. Half-adders have a major limitation in that they cannot- 1
(a) Accept a carry bit from a present stage
(b) Accept a carry bit from a next stage
(c) Accept a carry bit from a previous stage
(d) Accept a carry bit from the following stages
- v. Latches constructed with NOR and NAND gates tend to remain in the 1 latched condition due to which configuration feature?
(a) Low input voltages (b) Gate impedance
(c) Synchronous operation (d) Cross coupling
- vi. In T flip flop, when T = 1, the flip-flop will be in the _____. 1
(a) Set mode (b) Complement mode
(c) Reset mode (d) Store mode
- vii. The total capacity of a memory that has 1024 addresses and can store 8 1 bits at each address is-
(a) 2048 (b) 16384 (c) 128 (d) 8192
- viii. How many address lines required for a 8K memory system? 1
(a) 13 (b) 11 (c) 12 (d) 8

[2]

- ix. Which logic has higher speed among all the logic families? 1
 (a) DTL (b) RTL (c) TTL (d) ECL
- x. A TTL circuit acts as a current sink in the- 1
 (a) High state (b) Low state (c) High impedance state (d) Ideal state
- Q.2** i. Convert the decimal number 250.5 to Base 7. 2
 ii. Convert the following in other canonical form: 3
 (a) $F(A,B,C)=\sum(0,2,6,7)$ (b) $F(W,X,Y,Z)=\prod(0,1,2,3,4,6,12)$
- iii. Reduce the following function using K-map technique- 5

$$F(A, B, C, D) = \prod(0, 3, 4, 7, 8, 10, 12, 14) + d(2, 6).$$
- OR** iv. Reduce the following using tabulation method- 5

$$F=m_2+m_3+m_4+m_6+m_7+m_9+m_{11}+m_{13}.$$
- Q.3** i. Show that a positive logic AND gate is a negative-logic OR gate and vice versa. 3
 ii. Design full adder circuit on the basis of following- 7
 (a) Circuit diagram (b) Truth table
 (c) Characteristic equation
- OR** iii. Define multiplexer. Implement the Boolean function using 8:1 mux. 7

$$F(A, B, C, D) = A'BD' + ACD + B'CD + A'C'D.$$
- Q.4** i. Define flip-flop. Write down its applications. 2
 ii. Explain race around condition with neat diagram. 3
 iii. Draw the circuit diagram of JK flip flop and explain its operation using truth table. 5
- OR** iv. Design an asynchronous MOD 10 up counter with neat diagram & truth table. 5
- Q.5** i. State the classification of memories. Write down differences between RAM & ROM. 3
 ii. Write notes on any two of the following: 7
 (a) EPROM (b) PAL (c) SRAM
- OR** iii. A combinational circuit is defined by the functions. 7

$$F_1(a, b, c) = m(3, 5, 6, 7)$$

$$F_2(a, b, c) = m(0, 2, 4, 7)$$
 implement the circuit with a PLA.

[3]

Q.6

Attempt any two:

- i. Write down following specification for logic families 5
 - (a) Propagation delay (b) Figure of merit (c) Fan out
- ii. State five characteristic of TTL logic. 5
- iii. Write note on CMOS, NMOS, PMOS. 5
