

BTECH
(SEM III) THEORY EXAMINATION 2021-22
DATA STRUCTURE

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief.

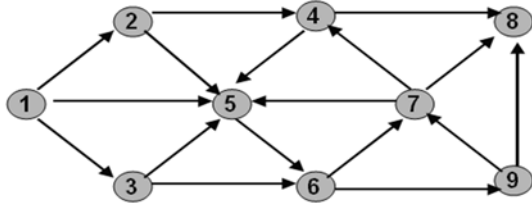
2X10 = 20

Q No	Questions	CO
(a)	Convert the infix expression $(A+B) * (C-D) \$E * F$ to postfix. Give the answer without any spaces.	1
(b)	Rank the following typical bounds in increasing order of growth rate: $O(\log n)$, $O(n^4)$, $O(1)$, $O(n^2 \log n)$	2
(c)	Draw the binary search tree that results from inserting the following numbers in sequence starting with 11: 11, 47, 81, 9, 61, 10, 12,	3
(d)	What does the following recursive function do for a given Linked List with first node as head? <pre>void fun1(struct node* head) { if(head == NULL) return; fun1(head->next); printf("%d ", head->data); }</pre>	4
(e)	Define a sparse matrix. Suggest a space efficient representation for space matrices.	5
(f)	List the advantages of doubly linked list over single linked list.	1
(g)	Give example of one each stable and unstable sorting techniques.	2
(h)	Write advantages of AVL tree over Binary Search Tree (BST)	3
(i)	What is tail recursion? Explain with a suitable example.	4
(j)	Write different representations of graphs in the memory.	5

SECTION B

2. Attempt any three of the following:

10X3 = 30

Q No	Questions	CO
(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.	1
(b)	Write algorithms of insertion sort. Implement the same on the following numbers; also calculate its time complexity. 13, 16, 10, 11, 4, 12, 6, 7	2
(c)	Differentiate between DFS and BFS. Draw the breadth First Tree for the above graph. 	3
(d)	Differentiate between liner and binary search algorithm. Write a recursive function to implement binary search.	4
(e)	What is the significance of maintaining threads in Binary Search Tree? Write an algorithm to insert a node in thread binary tree.	5

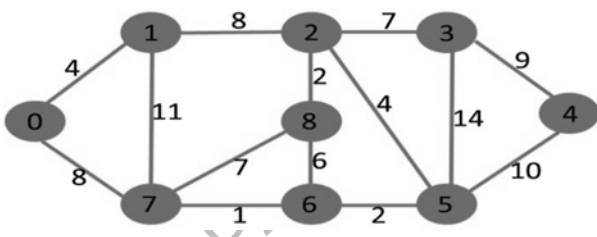
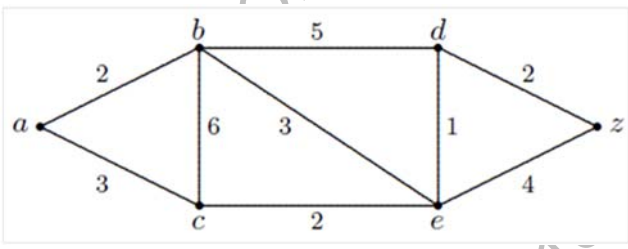
SECTION C

3. Attempt any one part of the following:

10X1 = 10

Q No	Questions	CO
(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.	1

BTECH
(SEM III) THEORY EXAMINATION 2021-22
DATA STRUCTURE

	(b) Discuss the representation of polynomial of single variable using linked list. Write 'C' functions to add two such polynomials represented by linked list.	1
4.	Attempt any one part of the following:	10 X1 = 10
Q No	Questions	CO
(a)	(i) Use the merge sort algorithm to sort the following elements in ascending order. 13, 16, 10, 11, 4, 12, 6, 7. What is the time and space complexity of merge sort? (ii) Use quick sort algorithm to sort 15,22,30,10,15,64,1,3,9,2. Is it a stable sorting algorithm? Justify.	2
(b)	(i) The keys 12, 17, 13, 2, 5, 43, 5 and 15 are inserted into an initially empty hash table of length 15 using open addressing with hash function $h(k) = k \text{ mod } 10$ and linear probing. What is the resultant hash table? (ii) Differentiate between linear and quadratic probing techniques.	2
5.	Attempt any one part of the following:	10X1 = 10
Q No	Questions	CO
(a)	Use Dijkstra's algorithm to find the shortest paths from source to all other vertices in the following graph. 	3
(b)	Apply Prim's algorithm to find a minimum spanning tree in the following weighted graph as shown below. 	3
6.	Attempt any one part of the following:	10X1 = 10
Q No	Questions	CO
(a)	(i) Write an iterative function to search a key in Binary Search Tree (BST). (ii) Discuss disadvantages of recursion with some suitable example.	4
(b)	(i) What is Recursion? (ii) Write a C program to calculate factorial of number using recursive and non-recursive functions.	4
7.	Attempt any one part of the following:	10X1 = 10
Q No	Questions	CO
(a)	(i) Why does time complexity of search operation in B-Tree is better than Binary Search Tree (BST)? (ii) Insert the following keys into an initially empty B-tree of order 5 a, g, f, b, k, d, h, m, j, e, s, i, r, x, c, l, n, t, u, p (iii) What will be the resultant B-Tree after deleting keys j, t and d in sequence?	5
(b)	(i) Design a method for keeping two stacks within a single linear array so that neither stack overflow until all the memory is used. (ii) Write a C program to reverse a string using stack.	5



BTECH
(SEM III) THEORY EXAMINATION 2021-22
COMPUTER ORGANIZATION AND ARCHITECTURE

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If you require any missing data, then choose suitably.**SECTION A**

1. **Attempt all questions in brief.** **2x10 = 20**

Qno	Questions	CO
(a)	List and briefly define the main structural components of a computer.	CO1
(b)	Differentiate between horizontal and vertical microprogramming.	CO3
(c)	Represent the following conditional control statements by two register transfer statements with control functions. If(P=1) then (R1 ← R2) else if (Q=1) then (R1 ← R3)	CO1
(d)	Design a 4-bit combinational incremental circuit using four full adder circuits.	CO2
(e)	Differentiate between Daisy chaining and centralized parallel arbitration.	CO5
(f)	What is the transfer rate of an eight-track magnetic tape whose speed is 120 inches per second and whose density is 1600 bits per inch?	CO5
(g)	Register A holds the binary values 10011101. What is the register value after arithmetic shift right? Starting from the initial number 10011101, determine the register value after arithmetic shift left, and state whether there is an overflow.	CO2
(h)	What is an Associative memory? What are its advantages and disadvantages?	CO4
(i)	Differentiate between static RAM and Dynamic RAM.	CO4
(j)	What are the different types of instruction formats?	CO3

SECTION B

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

Qno	Questions	CO
(a)	A digital computer has a common bus system for 8 registers of 16 bit each. The bus is constructed using multiplexers. I. How many select input are there in each multiplexer? II. What is the size of multiplexers needed? III. How many multiplexers are there in the bus?	CO1
(b)	Explain destination-initiated transfer using handshaking method.	CO5
(c)	Explain 2-bit by 2-bit Array multiplier. Draw the flowchart for divide operation of two numbers in signed magnitude form.	CO2
(d)	A digital computer has a memory unit of 64K X 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words. I. How many bits are there in the tag, index, block, and word fields of the address format? II. How many bits are there in each word of cache, and how they are divided into functions? Include a valid bit. III. How many blocks can the cache accommodate?	CO4
(e)	Explain with neat diagram, the address selection for control memory.	CO3

**BTECH**
(SEM III) THEORY EXAMINATION 2021-22
COMPUTER ORGANIZATION AND ARCHITECTURE**SECTION C**

- 3. Attempt any one part of the following: 10x1 = 10**

Qno	Questions	CO
(a)	A binary floating-point number has seven bits for a biased exponent. The constant used for the bias is 64. I. List the biased representation of all exponents from -64 to +63. II. Show that after addition of two biased exponents, it is necessary to subtract 64 in order to have a biased exponent's sum. III. Show that after subtraction of two biased exponents, it is necessary to add 64 in order to have a biased exponent's difference.	CO2
(b)	Show the multiplication process using Booth algorithm, when the following binary numbers, (+13) x (-15) are multiplied.	CO2

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

Qno	Questions	CO
(a)	Draw a diagram of a Bus system in which it uses 3 state buffers and a decoder instead of the multiplexers.	CO1
(b)	Explain in detail multiple bus organization with the help of a diagram.	CO1

- 5. Attempt any one part of the following: 10x1 = 10**

Qno	Questions	CO
(a)	The logical address space in a computer system consists of 128 segments. Each segment can have up to 32 pages of 4K words each. Physical memory consists of 4K blocks of 4K words each. Formulate the logical and physical address formats.	CO4
(b)	How is the Virtual address mapped into physical address? What are the different methods of writing into cache?	CO4

- 6. Attempt any one part of the following: 10x1 = 10**

Qno	Questions	CO
(a)	Explain how the computer buses can be used to communicate with memory and I/O. Also draw the block diagram for CPU-IOP communication.	CO5
(b)	What are the different methods of asynchronous data transfer? Explain in detail.	CO5

- 7. Attempt any one part of the following: 10x1 = 10**

Qno	Questions	CO
(a)	Write a program to evaluate arithmetic expression using stack organized computer with 0-address instructions. $X = (A-B) * (((C - D * E) / F) / G)$	CO3
(b)	List the differences between hardwired and micro programmed control in tabular format. Write the sequence of control steps for the following instruction for single bus architecture. $R1 \leftarrow R2 * (R3)$	CO3

BTECH
(SEM III) THEORY EXAMINATION 2021-22
DISCRETE STRUCTURES & THEORY OF LOGIC

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2x10 = 20

Qno.	Question	Marks	CO
a.	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	1
b.	Solve Ackerman Function $A(2,1)$.	2	1
c.	State and justify "Every cyclic group is an abelian group".	2	2
d.	State Ring and Field with example.	2	2
e.	Differentiate complemented lattice and distributed lattice.	2	3
f.	State De Morgan's law and Absorption Law.	2	3
g.	Translate the conditional statement "If it rains, then I will stay at home" into contrapositive, converse and inverse statement.	2	4
h.	State Universal Modus Ponens and Universal Modus Tollens laws.	2	4
i.	Explain Euler's formula. Determine number of regions if a planar graph has 30 vertices of degree 3 each.	2	5
j.	Explain pigeonhole principle with example.	2	5

SECTION B

2. Attempt any three of the following:

3x10 = 30

Qno.	Question	Marks	CO
a.	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	1
b.	Explain Cyclic group. Let H be a subgroup of a finite group G. Justify the statement "the order of H is a divisor of the order of G".	10	2
c.	Solve $E(x,y,z,t) = \sum (0,2,6,8,10,12,14,15)$ using K-map.	10	3
d.	Construct the truth table for the following statements: i) $(P \rightarrow Q') \rightarrow P'$ ii) $P \leftrightarrow (P' \vee Q')$.	10	4
e.	Solve the recurrence relation using generating function. $a_{n+2} - 5a_{n+1} + 6a_n = 2$, with $a_0=3$ and $a_1=7$.	10	5

SECTION C

3. Attempt any one part of the following:

1x10 = 10

Qno.	Question	Marks	CO
a.	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	1
b.	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 $f: A \rightarrow B$ and $g: B \rightarrow C$ be one-to-one onto functions, then gof is also one to one onto and $(\text{gof})^{-1} = f^{-1} \circ g^{-1}$ ".	10	1

BTECH
(SEM III) THEORY EXAMINATION 2021-22
DISCRETE STRUCTURES & THEORY OF LOGIC

4. Attempt any one part of the following: 1x10=10

Qno.	Question	Marks	CO
a.	Define the binary operation $*$ on Z by $x*y=x+y+1$ for all x,y belongs to set of integers. Verify that $(Z,*)$ is abelian group? Discuss the properties of abelian group.	10	2
b.	i) Justify that "The intersection of any two subgroup of a group $(G,*)$ is again a subgroup of $(G,*)$ ". ii) Justify that "If a,b are the arbitrary elements of a group G then $(ab)^2 = a^2b^2$ if and only if G is abelian.	10	2

5. Attempt any one part of the following: 1x10=10

Qno.	Question	Marks	CO
a.	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	3
b.	i) Justify that (D_{36}, \vee) 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	3

6. Attempt any one part of the following: 1x10=10

Qno.	Question	Marks	CO
a.	Use rules of inference to Justify that the three hypotheses (i) "If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on." (ii) "If the sailing race is held, then the trophy will be awarded." (iii) "The trophy was not awarded." imply the conclusion (iv) "It rained."	10	4
b.	Justify that the following premises are inconsistent. (i) If Nirmala misses many classes through illness then he fails high school. (ii) If Nirmala fails high school, then he is uneducated. (iii) If Nirmala reads a lot of books then he is not uneducated. (iv) Nirmala misses many classes through illness and reads a lot of books.	10	4

7. Attempt any one part of the following: 1x10=10

Qno.	Question	Marks	CO
a.	Explain the following terms with example: i. Graph coloring and chromatic number. ii. How many edges in K_7 and $K_{3,3}$ iii. Isomorphic Graph and Hamiltonian graph. iv. Bipartite graph. v. Handshaking theorem.	10	5
b.	i. Justify that "In a undirected graph the total number of odd degree vertices is even". ii. Justify that "The maximum number of edges in a simple graph is $n(n-1)/2$ ".	10	5



PAPER ID-411310

Printed Page: 1 of 2

Subject Code: KNC302

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

BTECH
(SEM III) THEORY EXAMINATION 2021-22
PYTHON PROGRAMMING

Time: 3 Hours**Total Marks: 50****Note:** Attempt all Sections. If you require any missing data, then choose suitably.**SECTION A****1. Attempt all questions in brief.****2*5 = 10**

Qno	Questions	CO
(a)	Explain the Programming Cycle for Python in detail.	1
(b)	What will be the output of the following Python code? <pre>i = 0 while i < 3: print(i) i += 1 else: print(0)</pre>	2
(c)	What will be the output of the following Python code? <pre>def cube(x): return x * x * x x = cube(3) print x</pre>	3
(d)	How do we define an Interface for an ADT?	4
(e)	How do you perform a search in Python?	5

SECTION B**2. Attempt any three of the following:****5*3 = 15**

Qno	Questions	CO
(a)	What do you mean by Python IDE? Explain in detail.	1
(b)	How can you randomize the items of a list in place in Python?	2
(c)	Explain Tuples and Unpacking Sequences in Python Data Structure.	3
(d)	What are File input and output operations in Python Programming?	4
(e)	Solve the Tower of Hanoi problem for n= 3 disk and show all the steps.	5

SECTION C**3. Attempt any one part of the following:****5*1 = 5**

Qno	Questions	CO
(a)	Write a program in Python to execute the Selection sort algorithm.	5
(b)	Explain why python is considered an interpreted language.	1

4. Attempt any one part of the following:**5 *1 = 5**

Qno	Questions	CO
(a)	Write a Python program to construct the following pattern, using a nested for loop. <pre>* * * * * * * * * * * * * * *</pre>	2



PAPER ID-411310

Printed Page: 2 of 2

Subject Code: KNC302

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

BTECH
(SEM III) THEORY EXAMINATION 2021-22
PYTHON PROGRAMMING

	* * * *	
	* * *	
	* *	
	*	
(b)	Write a program to produce Fibonacci series in Python.	4

5. Attempt any *one* part of the following: 5*1 = 5

Qno	Questions	CO
(a)	Write a Python program to change a given string to a new string where the first and last chars have been exchanged.	3
(b)	Write a Python program to add an item in a tuple.	3

6. Attempt any *one* part of the following: 5*1 = 5

Qno	Questions	CO
(a)	How to create and import a module in Python?	4
(b)	Explain the algorithm Sieve of Eratosthene used in Python Programming.	4

7. Attempt any *one* part of the following: 5*1 = 5

Qno	Questions	CO
(a)	Write a Recursive function in python BinarySearch(Arr,l,R,X) to search the given element X to be searched from the List Arr having R elements, where l represent slower bound and R represents the upper bound.	5
(b)	Explain the terms Merge List and Merge Sort in Python Programming.	5

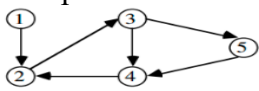


Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B. TECH
(SEM III) THEORY EXAMINATION 2020-21
DATA STRUCTURES

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Define Time-Space trade-off.	2	1
b.	Differentiate Array and Linked list.	2	1
c.	Explain Tail Recursion with suitable example.	2	2
d.	Write the full and empty condition for a circular queue data structure.	2	2
e.	Examine the minimum number of interchanges needed to convert the array 90, 20, 41, 18, 13, 11, 3, 6, 8, 12, 7, 71, 99 into a maximum heap.	2	3
f.	Differentiate sequential search and binary search.	2	3
g.	Compute the Transitive closure of following graph. 	2	4
h.	Write short notes on adjacency multi list representation a Graph.	2	4
i.	What is the importance of threaded binary tree?	2	5
j.	Write short notes on min heap.	2	5

SECTION B**2. Attempt any three of the following:**

Q no.	Question	Marks	CO
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.	10	1
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.	10	2
c.	Explain any three commonly used hash function with the suitable example? A hash function H defined as $H(\text{key}) = \text{key} \% 7$, with linear probing, is used to insert the key 37, 38, 72, 48, 98, 11, 66 into a table indexed from 0 to 6. what will be the location of key 11? Justify your answer, also count the total number of collisions in this probing.	10	3
d.	Write an algorithm for Breadth First search (BFS) and explain with the help of suitable example.	10	4
e.	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.	10	5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SECTION C**3. Attempt any one part of the following:**

Q no.	Question	Marks	CO
a.	Consider the two dimensional lower triangular matrix (LTM) of order N ,Obtain the formula for address calculation in the address of row major and column major order for location LTM[j][k], if base address is BA and space occupied by each element is w byte.	10	1
b.	Write a C program to insert a node at k th position in single linked list.	10	1

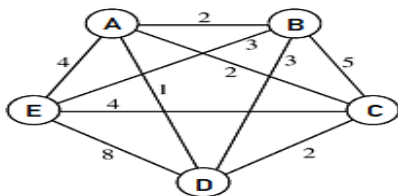
4. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Convert the following infix expression to reverse polish notation expression using stack. $x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$	10	2
b.	Write a C program to implement stack using single linked list.	10	2

5. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Write an algorithm for merge sort and apply on following elements 45,32,65,76,23,12,54,67,22,87.	10	3
b.	Write a C program for Index Sequential Search.	10	3

6. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Describe Prim's algorithm and find the cost of minimum spanning tree using Prim's Algorithm. 	10	4
b.	Apply the Floyd warshall's algorithm in above mentioned graph (i.e. in Q.no 6a)	10	4

7. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Write Short notes of following (a) Extended Binary Trees (b) Complete Binary Tree (c) Threaded Binary Tree.	10	5
b.	Insert the following sequence of elements into an AVL tree, starting with empty tree 71,41,91,56,60,30,40,80,50,55 also find the minimum array size to represent this tree.	10	5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B TECH
(SEM-III) THEORY EXAMINATION 2020-21
COMPUTER ORGANIZATION AND ARCHITECTURE

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Define the term Computer architecture and Computer organization.	2	1
b.	What is mean by bus arbitration? List different types of bus arbitration.	2	1
c.	Discuss biasing with reference to floating point representation.	2	2
d.	What is restoring method in division algorithm?	2	2
e.	Define micro operation and micro code.	2	3
f.	Write short note on RISC.	2	3
g.	Define hit ratio.	2	4
h.	What do you mean by page fault?	2	4
i.	Explain the term cycle stealing.	2	5
j.	What do you mean by vector interrupt? Explain.	2	5

SECTION B**2. Attempt any three of the following:****3 x 10 = 30**

Q no.	Question	Marks	CO
a.	i. Draw a diagram of bus system using MUX which has four registers of size 4 bits each. ii. Evaluate the arithmetic statement. $X = A + B * [C * D + E * (F + G)]$ using a stack organized computer with zero address operation instructions.	10	1
b.	Explain in detail the principle of carry look ahead adder and design 4-bit CLA adder.	10	2
c.	Draw the flowchart for instruction cycle with neat diagram and explain.	10	3
d.	Discuss 2 D RAM and 2.5D RAM with suitable diagram.	10	4
e.	Draw and explain the block diagram of typical DMA controller.	10	5

SECTION C**3. Attempt any one part of the following:**

Q no.	Question	Marks	CO
a.	An instruction is stored at location 400 with its address field at location 401. The address field has the value 500. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is (i) direct (ii) immediate (iii) relative (iv) register indirect (v) index with R1 as index register	10	1
b.	What do you mean by processor organization? Explain various types of processor organization.	10	1

4. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Show the systemic multiplication process of (20) X (-19) using Booth's algorithm	10	2
b.	Explain IEEE standard for floating point representation. Represent the number $(-1460.125)_{10}$ in single precision and double precision format.	10	2



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

5. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	What is a micro program sequencer? With block diagram, explain the working of micro program sequencer.	10	3
b.	Differentiate between hardwired and micro programmed control unit. Explain each component of hardwired control unit organization.	10	3

6. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Calculate the page fault for a given string with the help of LRU & FIFO page replacement algorithm, Size of frames = 4 and string 1 2 3 4 2 1 5 6 2 1 2 3 7 6 3 2 1 2 3 6	10	4
b.	A computer uses RAM chips of 1024*1 capacity. i) How many chips are needed & how should their address lines be connected to provide a memory capacity of 1024*8? ii) How many chips are needed to provide a memory capacity of 16 KB?	10	4

7. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	What do you mean by asynchronous data transfer? Explain strobe control and hand shaking mechanism.	10	5
b.	Discuss the different modes of data transfer.	10	5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B TECH
(SEM-III) THEORY EXAMINATION 2020-21
DISCRETE STRUCTURE & THEORY OF LOGIC

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Check whether the function $f(x) = x^2 - 1$ is injective or not for $f : \mathbb{R} \rightarrow \mathbb{R}$.	2	CO3
b.	Let R be a relation on set A with cardinality n. Write down the number of reflexive and symmetric relation on set A.	2	CO2
c.	Define group.	2	CO3
d.	Define ring.	2	CO3
e.	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	CO3
f.	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	CO3
g.	Write the negation of the following statement: "If I wake up early in the morning, then I will be healthy."	2	CO1
h.	Express the following statement in symbolic form: "All flowers are beautiful."	2	CO1
i.	Define complete and regular graph.	2	CO4
j.	Prove that the maximum number of vertices in a binary tree of height h is 2^{h+1} , $h \geq 0$.	2	CO4

SECTION B**2. Attempt any three of the following:**

Q no.	Question	Marks	CO
a.	If $f : \mathbb{R} \rightarrow \mathbb{R}$, $g : \mathbb{R} \rightarrow \mathbb{R}$ and $h : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 3x^2 + 2$, $g(x) = 7x - 5$ and $h(x) = 1/x$. Compute the following composition functions i. $(f \circ g \circ h)(x)$ ii. $(g \circ g)(x)$ iii. $(g \circ h)(x)$ iv. $(h \circ g \circ f)(x)$	10	CO3
b.	State and prove Lagrange theorem for group.	10	CO3
c.	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	CO3
d.	Prove the validity of the following argument "If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. I will not be happy. Therefore, either I will not get the job, or I will not work hard."	10	CO1
e.	If a connected planar graph G has n vertices, e edges and r region, then $n - e + r = 2$.	10	CO5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SECTION C

3. Attempt any *one* part of the following:

a.	Prove by mathematical induction for all positive integers that $3 \cdot 5^{2n+1} + 2^{3n+1}$ is divisible by 17.	10	CO2
b.	Find the numbers between the 100 to 1000 that are divisible by 3 or 5 or 7.	10	CO2

4. Attempt any *one* part of the following:

a.	A subgroup H of a group G is a normal subgroup if and only if $g^{-1}hg \in H$ for every $h \in H$ and $g \in G$.	10	CO3
b.	In a group $(G, *)$ prove that i. $(a^{-1})^{-1} = a$ ii. $(ab)^{-1} = b^{-1}a^{-1}$	10	CO3

5. Attempt any *one* part of the following:

a.	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	CO3
b.	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	CO3

6. Attempt any *one* part of the following:

a.	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	CO1
b.	Translate the following statements in symbolic form i. The sum of two positive integers is always positive. ii. Everyone is loved by someone. iii. Some people are not admired by everyone. iv. If a person is female and is a parent, then this person is someone's mother.	10	CO1

7. Attempt any *one* part of the following:

a.	Construct the binary tree whose inorder and preorder traversal is given below. Also, find the postorder traversal of the tree. Inorder: d, g, b, e, i, h, j, a, c, f Preorder: a, b, d, g, e, h, i, j, c, f	10	CO4
b.	Solve the following recurrence relation $a_n - a_{n-1} + 20a_{n-2} = 0$ where $a_0 = -3$, $a_1 = -10$	10	CO3



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B.TECH
(SEM III) THEORY EXAMINATION 2020-21
PYTHON PROGRAMMING

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.**

Q no.	Question	Marks	CO
a.	What is the use of “raise” statement? Describe with an example.	2	5
b.	Write a recursive Python function “rprint” to print all elements in a list in reverse. rprint([]) prints nothing rprint([1,2,3]) prints 3 2 1	2	3
c.	Describe the behavior of “range (s, e)” in Python.	2	3
d.	Explain the use of “with” construct in Python with an example program.	2	5
e.	Which of the following statements produce an error in Python? x, y, z = 1,2,3 # s1 a, b = 4,5,6 # s2 u = 7,8,9 # s3 (List all the statements that have error.)	2	1
f.	Explain the role of precedence with an example.	2	1
g.	How do you read an input from a user in Python to be used as an integer in the rest of the program? Explain with an example.	2	5
h.	Consider the program: x = ['12', 'hello', 456] x[0] *= 3 x[1][1] = 'bye' Explain why this program generates an error.	2	1
i.	What is the output of the following program? (lambda x,y : y - 2*x) (1, 11)	2	5
j.	Explain the use of <code>__init__</code> function in a class Python?	2	5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SECTION B

2. Attempt any *three* of the following:

Q no.	Question	Marks	CO
a.	Write a Python function <code>removekth(s, k)</code> that takes as input a string <code>s</code> and an integer <code>k ≥ 0</code> and removes the character at index <code>k</code> . If <code>k</code> is beyond the length of <code>s</code> , the whole of <code>s</code> is returned. For example, <code>removekth("PYTHON", 1)</code> returns <code>"PTHON"</code> <code>removekth("PYTHON", 3)</code> returns <code>"PYTON"</code> <code>removekth("PYTHON", 0)</code> returns <code>"YTHON"</code> <code>removekth("PYTHON", 20)</code> returns <code>"PYTHON"</code>	10	5
b.	Write a Python function <code>average</code> to compute the average of a list of numbers. The function must use <code>try-except</code> to handle the case where the input list is empty. Further, in that case the average for the empty list should be set to 0.0 using the <code>except</code> block.	10	3
c.	Describe the differences between a linear search and a binary search?	10	5
d.	Write a function <code>lessthan(lst, k)</code> to return list of numbers less than <code>k</code> from a list <code>lst</code> . The function must use list comprehension. Example: <code>lessthan([1, -2, 0, 5, -3], 0)</code> returns <code>[-2, -3]</code>	10	4
e.	Write a program <code>factors(N)</code> that returns a list of all positive divisors of <code>N</code> (<code>N ≥ 1</code>). For example: <code>factors(6)</code> returns <code>[1, 2, 3, 6]</code> <code>factors(1)</code> returns <code>[1]</code> <code>factors(13)</code> returns <code>[1, 13]</code>	10	2

SECTION C

3. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	How can you create Python file that can be imported as a library as well as run as a standalone script?	10	5
b.	Describe the difference between <code>import library</code> and <code>from library import *</code> when used in a python program. Here <code>library</code> is some python library.	10	5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

4. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Write a function <code>makePairs</code> that takes as input two lists of equal length and returns a single list of same length where k-th element is the pair of k-th elements from the input lists. For example, <pre>makePairs([1,3,5,7],[2,4,6,8]) returns [(1,2),(3,4),(5,6),(7,8)] makePairs([],[]) returns []</pre>	10	2
b.	Show an example where both Keyword arguments and Default arguments are used for the same function in a call. Show both the definition of the function and its call.	10	4

5. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Explain why Python is considered an interpreted language.	10	1
b.	What is short circuit evaluation? What is printed by the following Python program? <pre>a = 0 b = 2 c = 3 x = c or a print(x)</pre>	10	1



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

6. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	<p>Write a Python program, <code>triangle(N)</code>, that prints a right triangle having base and height consisting of <code>N * *</code> symbols as shown in these examples:</p> <p><code>triangle(3)</code> prints:</p> <pre>* ** ***</pre> <p><code>triangle(5)</code> prints:</p> <pre>* ** *** **** *****</pre>	10	3
b.	<p>Write a Python program, <code>countSquares(N)</code>, that returns the count of perfect squares less than or equal to <code>N</code> ($N > 1$). For example:</p> <pre>countSquares(1) returns 1 # Only 1 is a perfect square <= 1 countSquares(5) returns 2 # 1, 4 are perfect squares <= 5 countSquares(55) returns 7 # 1, 4, 9, 16, 25, 36, 49 <= 55</pre>	10	4

7. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	<p>Write a Python function, <code>alternating(lst)</code>, that takes as argument a sequence <code>lst</code>. The function returns <code>True</code> if the elements in <code>lst</code> are alternately odd and even, starting with an even number. Otherwise it returns <code>False</code>. For example:</p> <pre>alternating([10, 9, 9, 6]) returns False alternating([10, 15, 8]) returns True alternating([10]) returns True alternating([]) returns True alternating([15, 10, 9]) returns False</pre>	10	4
b.	<p>Write a Python function, <code>searchMany(s, x, k)</code>, that takes as argument a sequence <code>s</code> and integers <code>x, k</code> ($k > 0$). The function returns <code>True</code> if there are <i>at most k occurrences of x in s</i>. Otherwise it returns <code>False</code>. For example:</p> <pre>searchMany([10, 17, 15, 12], 15, 1) returns True searchMany([10, 12, 12, 12], 12, 2) returns False searchMany([10, 12, 15, 11], 17, 18) returns True</pre>	10	3

B. TECH.
(SEM III) THEORY EXAMINATION 2019-20
DATA STRUCTURES

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

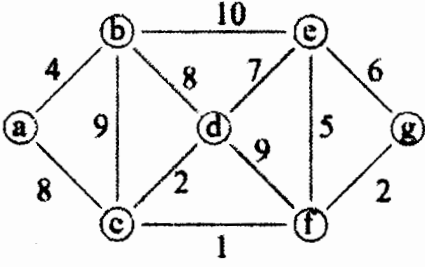
2 x 10 = 20

Qno.	Question	Marks	CO
a.	How can you represent a sparse matrix in memory?	2	CO1
b.	List the various operations on linked list.	2	CO1
c.	Give some applications of stack.	2	CO2
d.	Explain Tail recursion.	2	CO2
e.	Define priority queue. Given one application of priority queue.	2	CO3
f.	How does bubble sort work? Explain.	2	CO3
g.	What is Minimum cost spanning tree? Give its applications.	2	CO4
h.	Compare adjacency matrix and adjacency list representations of graph.	2	CO4
i.	Define extended binary tree, full binary tree, strictly binary tree and complete binary tree.	2	CO5
j.	Explain threaded binary tree.	2	CO5

SECTION B

2. Attempt any three of the following:

3 x 10 = 30

Qno.	Question	Marks	CO
a.	What are the merits and demerits of array? Given two arrays of integers in ascending order, develop an algorithm to merge these arrays to form a third array sorted in ascending order.	10	CO1
b.	Write algorithm for Push and Pop operations in stack. Transform the following expression into its equivalent postfix expression using stack: $A + (B * C - (D / E \uparrow F) * G) * H$	10	CO2
c.	How binary search is different from linear search? Apply binary search to find item 40 in the sorted array: 11, 22, 30, 33, 40, 44, 55, 60, 66, 77, 80, 88, 99. Also discuss the complexity of binary search.	10	CO3
d.	Find the minimum spanning tree in the following graph using Kruskal's algorithm: 	10	CO4
e.	What is the difference between a binary search tree (BST) and heap? For a given sequence of numbers, construct a heap and a BST. 34, 23, 67, 45, 12, 54, 87, 43, 98, 75, 84, 93, 31	10	CO5

SECTION C

3. Attempt any *one* part of the following:

$$1 \times 10 = 10$$

Qno.	Question	Marks	CO
a.	What is doubly linked list? What are its applications? Explain how an element can be deleted from doubly linked list using C program.	10	CO1
b.	Define the following terms in brief: (i) Time complexity (ii) Space complexity (ii) Asymptotic Notation (iv) Big O Notation	10	CO1

4. Attempt any *one* part of the following:

$$1 \times 10 = 10$$

Qno.	Question	Marks	CO
a.	(i) Differentiate between iteration and recursion. (ii) Write the recursive solution for Tower of Hanoi problem.	10	CO2
b.	Discuss array and linked representation of queue data structure. What is dequeue?	10	CO2

5. Attempt any *one* part of the following:

$$1 \times 10 = 10$$

Qno.	Question	Marks	CO
a.	Why is quick sort named as quick? Show the steps of quick sort on the following set of elements: 25, 57, 48, 37, 12, 92, 86, 33 Assume the first element of the list to be the pivot element.	10	CO3
b.	What is hashing? Give the characteristics of hash function. Explain collision resolution technique in hashing.	10	CO3

6. Attempt any *one* part of the following:

$$1 \times 10 = 10$$

Qno.	Question	Marks	CO
a.	Explain warshall's algorithm with the help of an example.	10	CO4
b.	Describe the Dijkstra algorithm to find the shortest path. Find the shortest path in the following graph with vertex 'S' as source vertex.	10	CO4

```

graph LR
    S((S)) -- 10 --> A((A))
    S -- 5 --> C((C))
    A -- 1 --> B((B))
    A -- 3 --> C
    A -- 2 --> D((D))
    B -- 9 --> C
    B -- 4 --> D
    C -- 2 --> D
    D -- 6 --> B
    
```

7. Attempt any *one* part of the following:

$$1 \times 10 = 10$$

Qno.	Question	Marks	CO
a.	Can you find a unique tree when any two traversals are given? Using the following traversals construct the corresponding binary tree: INORDER: H K D B I L E A F C M J G PREORDER: A B D H K E I L C F G J M Also find the Post Order traversal of obtained tree.	10	CO5
b.	What is a B-Tree? Generate a B-Tree of order 4 with the alphabets (letters) arrive in the sequence as follows: a g f b k d h m j e s i r x c l n t u p	10	CO5

Paper Id: 110322

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B. TECH.
(SEM-III) THEORY EXAMINATION 2019-20
COMPUTER ORGANIZATION AND ARCHITECTURE

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A1. Attempt *all* questions in brief.

2 x 10 = 20

Qno.	Question	Marks	C O
a.	Define the term Computer Architecture.	2	1
b.	Draw the basic functional units of a computer.	2	1
c.	Perform the 2's complement subtraction of smaller number (101011) from larger number (111001).	2	2
d.	What is the role of Multiplexer and Decoder?	2	2
e.	Write the differences between RISC and CISC.	2	3
f.	What are the types of microinstructions available?	2	3
g.	What is SRAM and DRAM?	2	4
h.	What is the difference between 2D and 2 ^{1/2} D memory organization?	2	4
i.	What is I/O control method?	2	5
j.	What is bus arbitration?	2	5

SECTION B2. Attempt any *three* of the following:

Qno.	Question	Marks	C O
a.	Convert the following arithmetic expressions from infix to reverse polish notation: i. $A*B+C*D+E*F$ ii. $A*[B+C*CD+E]/F*(G+H)$	5+5	1
b.	Design a 4-bit Carry-Look ahead Adder and explain its operation with an example.	10	2
c.	i. Draw the timing diagram for a instruction cycle and explain. ii. Give a note on subroutine.	5+5	3
d.	What do you mean by virtual memory? Discuss how paging helps in implementing virtual memory.	10	4
e.	What is DMA? Describe how DMA is used to transfer data from peripherals.	10	5

SECTION C3. Attempt any *one* part of the following:

Qno.	Question	Marks	C O
a.	Describe in detail the different kinds of addressing modes with an example.	10	1
b.	Discuss stack Organization. Explain the following in details- (i) Register stack (ii) Memory stack	10	1

Paper Id: 110322

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

4. Attempt any one part of the following:

Qno.	Question	Marks	C O
a.	Represent the following decimal number in IEEE standard floating-point format in a single precision method (32-bit) representation method. i. $(65.175)_{10}$ ii. $(-307.1875)_{10}$	5+5	2
b.	Using Booth algorithm perform the multiplication on the following 6-bit unsigned integer $10110011 * 11010101$	10	2

5. Attempt any one part of the following:

Qno.	Question	Marks	C O
a.	What is parallelism and pipelining in computer Architecture?	10	3
b.	Explain the organization of Microprogrammed control unit in detail.	10	3

6. Attempt any one part of the following:

Qno.	Question	Marks	C O
a.	Discuss the different mapping techniques used in cache memories and their relative merits and demerits.	10	4
b.	RAM chip 4096×8 bits has two enable lines. How many pins are needed for the integrated circuits package? Draw a block diagram and label all input and outputs of the RAM. What is main feature of random-access memory?	5+5	4

7. Attempt any one part of the following:

Qno.	Question	Marks	C O
a.	Write down the difference between isolated I/O and memory mapped I/O. Also discuss advantages and disadvantages of isolated I/O and memory mapped I/O.	10	5
b.	i. Discuss the design of a typical input or output interface. ii. What are interrupts? How are they handled?	10	5

B. TECH.
(SEM III) THEORY EXAMINATION 2019-20
DISCRETE STRUCTURES & THEORY OF LOGIC

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief.

$$2 \times 10 = 20$$

Qno.	Question	Marks	CO
a.	Define various types of functions.	2	CO1
b.	How many symmetric and reflexive relations are possible from a set A containing 'n' elements?	2	CO1
c.	Let Z be the group of integers with binary operation * defined by $a*b = a + b - 2$, for all $a, b \in Z$. Find the identity element of the group $\langle Z, * \rangle$	2	CO2
d.	Show that every cyclic group is abelian.	2	CO2
e.	Prove that a lattice with 5 elements is not a boolean algebra.	2	CO3
f.	Write the contra positive of the implication: "if it is Sunday then it is a holiday".	2	CO4
g.	Show that the propositions $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent.	2	CO4
h.	Show that there does not exist a graph with 5 vertices with degrees 1, 3, 4, 2, 3 respectively.	2	CO5
i.	Obtain the generating function for the sequence 4, 4, 4, 4, 4, 4, 4	2	CO5
j.	Define Pigeon hole principle.	2	CO5

SECTION B

2. Attempt any *three* of the following:

$$3 \times 10 = 30$$

Qno.	Question	Marks	CO
a.	Prove that $\frac{1}{\sqrt{1}} + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \dots + \frac{1}{\sqrt{n}} > \sqrt{n}$ for $n \geq 2$ using principle of mathematical induction	10	CO1
b.	What do you mean by cosets of a subgroup? Consider the group Z of integers under addition and the subgroup $H = \{\dots, -12, -6, 0, 6, 12, \dots\}$ considering of multiple of 6 (i) Find the cosets of H in Z (ii) What is the index of H in Z .	10	CO2
c.	Show that the following are equivalent in a Boolean algebra $a \leq b \Leftrightarrow a * b' = 0 \Leftrightarrow b' \leq a' \Leftrightarrow a' \oplus b = 1$	10	CO3
d.	Show that $((P \vee Q) \wedge \neg(\neg Q \vee \neg R)) \vee (\neg P \vee \neg Q) \vee (\neg P \vee \neg R)$ is a tautology by using equivalences.	10	CO4
e.	Define planar graph. Prove that for any connected planar graph, $v - e + r = 2$ Where v, e, r is the number of vertices, edges, and regions of the graph respectively.	10	CO5

Paper Id: 110323

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

SECTION C

3. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Find the numbers between 1 to 500 that are not divisible by any of the integers 2 or 3 or 5 or 7.	10	CO1
b.	Is the "divides" relation on the set of positive integers transitive? What is the reflexive and symmetric closure of the relation? $R = \{(a, b) \mid a > b\}$ on the set of positive integers?	10	CO1

4. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	What is Ring? Define elementary properties of Ring with example.	10	CO2
b.	Prove or disprove that intersection of two normal subgroups of a group G is again a normal subgroup of G.	10	CO2

5. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Let (L, \vee, \wedge, \leq) be a distributive lattice and $a, b \in L$. if $a \wedge b = a \wedge c$ and $a \vee b = a \vee c$ then show that $b = c$	10	CO3
b.	Obtain the principle disjunctive and conjunctive normal forms of the formula $(\neg p \rightarrow r) \wedge (q \leftrightarrow p)$	10	CO3

6. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Explain various Rules of Inference for Propositional Logic.	10	CO4
b.	Prove the validity of the following argument "if the races are fixed so the casinos are crooked, then the tourist trade will decline. If the tourist trade decreases, then the police will be happy. The police force is never happy. Therefore, the races are not fixed."	10	CO4

7. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Solve the following recurrence equation using generating function $G(K) - 7G(K-1) + 10G(K-2) = 8K + 6$	10	CO5
b.	A collection of 10 electric bulbs contain 3 defective ones (i) In how many ways can a sample of four bulbs be selected? (ii) In how many ways can a sample of 4 bulbs be selected which contain 2 good bulbs and 2 defective ones? (iii) In how many ways can a sample of 4 bulbs be selected so that either the sample contains 3 good ones and 1 defectives ones or 1 good and 3 defectives ones?	10	CO5

B. TECH.
(SEM III) THEORY EXAMINATION 2019-20
PYTHON PROGRAMMING

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Qno.	Question	Marks	CO
a.	What is the difference between list and tuples in Python?	2	CO3
b.	In some languages, every statement ends with a semi-colon (;). What happens if you put a semi-colon at the end of a Python statement?	2	CO2
c.	Mention five benefits of using Python.	2	CO4
d.	How is Python an interpreted language?	2	CO2
e.	What type of language is python?	2	CO1
f.	What are local variables and global variables in Python?	2	CO1
g.	What is the difference between Python Arrays and lists?	2	CO3
h.	Define ADT interface.	2	CO4
i.	Define floor division with example.	2	CO5
j.	Differentiate Fruitful functions and void functions.	2	CO3

SECTION B

2. Attempt any three of the following:

3 x 10 = 30

Qno.	Question	Marks	CO
a.	Explain iterator. Write a program to demonstrate the tower of Hanoi using function.	10	CO5
b.	Discuss function in python with its parts and scope. Explain with example. (Take Simple calculator with add, subtract, Division and Multiplication).	10	CO3
c.	Discuss ADT in python. How to define ADT? Write code for a student information.	10	CO4
d.	Explain all the Conditional statement in Python using small code example.	10	CO2
e.	What is Python? How Python is interpreted? What are the tools that help to find bugs or perform static analysis? What are Python decorators?	10	CO1

SECTION C

3. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Write short notes with example: The Programming Cycle for Python, Elements of Python, Type Conversion in Python, Operator Precedence, and Boolean Expression.	10	CO1
b.	How memory is managed in Python? Explain PEP 8. Write a Python program to print even length words in a string.	10	CO1

Paper Id: 199344

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

4. Attempt any *one* part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Explain Expression Evaluation & Float Representation with example. Write a Python Program for How to check if a given number is Fibonacci number.	10	CO2
b.	Explain the purpose and working of loops. Discuss Break and continue with example. Write a Python program to convert time from 12 hour to 24-hour format.	10	CO2

5. Attempt any *one* part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Explain higher order function with respect to lambda expression. Write a Python code to Count occurrences of an element in a list.	10	CO3
b.	Explain Unpacking Sequences, Mutable Sequences, and List Comprehension with example. Write a program to sort list of dictionaries by values in Python – Using lambda function.	10	CO3

6. Attempt any *one* part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Discuss File I/O in python. How to perform open, read, write, and close into a file? Write a Python program to read a file line-by-line store it into a variable.	10	CO4
b.	Discuss Exceptions and Assertions in python. How to handle Exceptions with Try-Finally? Explain 5 Built-in Exceptions with example.	10	CO4

7. Attempt any *one* part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Discuss and differentiate Iterators & Recursion. Write a program for Recursive Fibonacci series.	10	CO5
b.	Discuss Sorting & Merging. Explain different types of sorting with example. Write a Python Program for Sieve of Eratosthenes.	10	CO5



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

BTECH
(SEM III) THEORY EXAMINATION 2021-22
SENSOR AND INSTRUMENTATION

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	Define the term Transducer.	2	1
b.	Define the parameter measured with a Strain Gauge.	2	1
c.	What is an RTD used for?	2	2
d.	Explain level sensors and their applications.	2	2
e.	Define the term instrumentation.	2	3
f.	What are clusters and graphs?	2	3
g.	What is a timer? Explain with an example.	2	4
h.	What are the applications of a data socket?	2	4
i.	Define the term sensors.	2	5
j.	What is an autonomous robot?	2	5

SECTION B**2. Attempt any three of the following:**

a.	Define different categories of sensors and the process to select a sensor for any process.	10	1
b.	Define different types of Proximity sensors.	10	2
c.	Elaborate on different techniques used for Graphical Programming.	10	3
d.	Define the basic block diagram of a Data Acquisition System.	10	4
e.	What is an intelligent sensor? Define different components associated with intelligent sensors.	10	5

SECTION C**3. Attempt any one part of the following:**

a.	What is an LVDT and how it is arranged for measuring pressure?	10	1
b.	What is a piezoelectric sensor? Define one application of the piezoelectric sensor.	10	1

4. Attempt any one part of the following:

a.	What is Hall Effect and how it is used for measuring position?	10	2
b.	Define different sensors used for measuring temperature.	10	2

5. Attempt any one part of the following:

a.	What is industrial instrumentation? Define different software tools used for automation.	10	3
b.	What is virtual instrumentation? Define different advantages of virtual instrumentation.	10	3

6. Attempt any one part of the following:

a.	Explain different types of Analog-to-Digital Converters.	10	4
b.	What are Input-Output (I/O)? Define different types of I/O.	10	4

7. Attempt any one part of the following:

a.	Define the characteristics associated with Intelligent Sensors: Self-calibration, Self-testing & self-communicating.	10	5
b.	Define the process and techniques associated with Automobile Engine Control.	10	5

Paper Id:

199358

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B.TECH
(SEM III) THEORY EXAMINATION 2019-20
SENSOR AND INSTRUMENTATION

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Qno.	Question	Marks	CO
a.	Define and explain accelerometer.	2	CO2
b.	Enlist the classification of errors.	2	CO4
c.	What do you mean by virtual instrumentation system?	2	CO3
d.	What is the concept of smart sensors? Where can they be used?	2	CO5
e.	What are basic elements of measurement system	2	CO1
f.	Discuss a Plug in DAQ device?	2	CO4
g.	What is the use of Data sockets for Networked communications	2	CO4
h.	Give the types of signals that can be acquired by DAQ	2	CO4
i.	Distinguish chart and graph	2	CO3
j.	Distinguish between commercial Instruments and traditional Instruments	2	CO3

SECTION B

2. Attempt any three of the following:

3 x 10 = 30

Qno.	Question	Marks	CO
a.	Explain the feature of Lab VIEW and how it can be used to measure the input signal	10	CO3
b.	Explain the position measurement using hall effect sensors.	10	CO2
c.	Explain the working principle of different types of flow sensors. Differentiate between Ultra Sonic and Electromagnetic type flow sensors.	10	CO2
d.	Explain the smart sensors used for automatic robot control	10	CO5
e.	Explain the concept of virtual Instrumentation. Explain software based virtual Instruments	10	CO3

SECTION C

3. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Explain the working principle of linear potentiometric displacement sensor and derive the expression for output voltage	10	CO1
b.	Explain the principle and working of a strain gauge. Derive the expression of gauge factor.	10	CO1

4. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	What is RTD? How RTD works? Write the types and wiring configuration of RTD	10	CO2
b.	Explain the types of proximity sensors and describe their use as accelerometer and vibration sensor	10	CO2

5. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Write an example of while and for loops in graphical programming techniques	10	CO3
b.	Describe state machine for handling RS-485 serial communication protocol	10	CO3

Paper Id: 199358

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

6. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Draw and explain the basic block diagram of data acquisition system.	10	CO4
b.	Explain the successive approximation and sigma delta methods of analog to digital converters.	10	CO4

7. Attempt any one part of the following:

1 x 10 = 10

Qno.	Question	Marks	CO
a.	Explain general structure of smart sensors and its components	10	CO5
b.	Write the application of smart sensors in automatic robotic control and & automobile engine control	10	CO5

MANISH KUMAR JHA
14-Dec-2019 08:57:50 | 117.55.242.191



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B TECH
(SEM-III) THEORY EXAMINATION 2020-21
SENSOR AND INSTRUMENTATION

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

Q no.	Question	Marks	CO
a.	classify the types of sensors	2	CO 1
b.	Explain piezoelectric sensor.	2	CO 1
c.	What is the Concept of thermal imaging?	2	CO 2
d.	Draw characteristics for Thermocouple.	2	CO 2
e.	Mention the role of software's in Virtual Instrumentation.	2	CO 3
f.	Define Clusters.	2	CO 3
g.	Explain Data Acquisition.	2	CO 4
h.	What is the Use of Data Sockets for Networked Communication?	2	CO 4
i.	Give few Applications of smart sensors.	2	CO 5
j.	Define Intelligent Sensors.	2	CO 5

SECTION B**2. Attempt any three of the following:****3 x 10 = 30**

Q no.	Question	Marks	CO
a.	How can you classify sensors? Explain each of them in detail. Give their suitable application with examples.	10	CO 1
b.	Explain the working of Inductive type Proximity sensors.	10	CO 2
c.	Differentiate between 'traditional instruments' and 'virtual instruments'.	10	CO 3
d.	Explain successive approximation for analog to digital conversion.	10	CO 4
e.	What are the various applications of smart sensors? Explain any one in detail.	10	CO 5

SECTION C**3. Attempt any one part of the following:**

Q no.	Question	Marks	CO
a.	With the help of a neat sketch explain the working of a 'LVDT'. What are its advantages and disadvantages?	10	CO 1
b.	A Strain Gauge having a Resistance of 120Ω gauge factor of 2 is connected in series with a ballast resistance of 120Ω across a 12v supply. Calculate the difference between the output voltage (voltage across strain gauge) with no stress applied & with a stress of 140 MN/m^2 , Modulus of elasticity of the member undergoing strain is 200GN/m	10	CO 1

4. Attempt any one part of the following:

a.	Briefly describe a 'Capacitive-type' level sensor.	10	CO 2
b.	Explain the working of ultrasonic and laser flow sensor.	10	CO 2

5. Attempt any one part of the following:

a.	Explain array and its function in detail.	10	CO 3
b.	Draw the architecture of Virtual Instrumentation and indicate the parts.	10	CO 3

6. Attempt any one part of the following:

a.	Explain the working of R-2R Ladder type for Digital to analog conversion.	10	CO 4
b.	Draw and explain a DAQ system with a neat block diagram.	10	CO 4

7. Attempt any one part of the following:

a.	Explain the General Structure of smart sensors & its components.	10	CO 5
b.	Discuss the various Characteristic of smart sensors.	10	CO 5