

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.

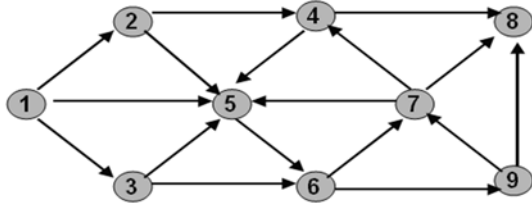
2X10 = 20

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 sparse 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 linear 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

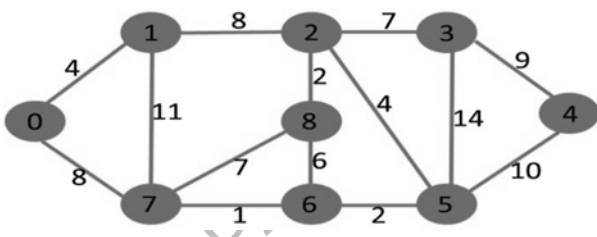
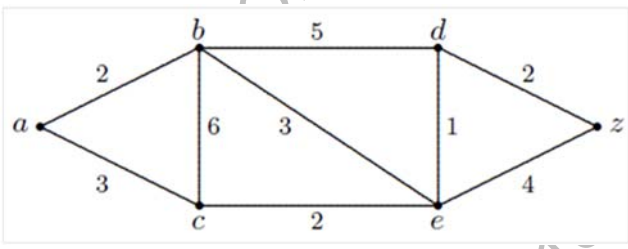
SECTION C

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-411526

Printed Page: 1 of 2

Subject Code: KAS302

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BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATHEMATICS-IV

Time: 3 Hours**Total Marks: 100****Instructions:** Attempt the questions as per the given instructions. Assume missing data suitably.

Section – A																									
	Attempt all parts in brief.			2 x 10=20																					
Q.1.	Question			Marks	CO.																				
(a).	Solve the following partial differential equation $(D^2 + DD')z = 0$.			2	1																				
(b).	Derive a partial differential equation by eliminating the constants a and b from $z = ax + a^2 y^2 + b$.			2	1																				
(c).	Write radio wave equations.			2	2																				
(d).	Classify the partial differential equation $u_{xx} + 3u_{xy} + u_{yy} = 0$			2	2																				
(e).	In an asymmetrical distribution mean is 16 and median is 20. Calculate the mode of the distribution.			2	3																				
(f).	The lines of regression of y on x and x on y are respectively $y = x + 5$ and $16x - 9y = 94$, Find the correlation coefficient.			2	3																				
(g).	Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Prove that the chance that exactly two of them will be children is 10/21.			2	4																				
(h).	If the probability density functions $f(x) = \begin{cases} kx^3, & \text{if } 0 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$, find the value of 'k'. Also, find the probability between $x = \frac{1}{2}$ and $x = \frac{3}{2}$.			2	4																				
(i).	Explain t-test for “small samples”.			2	5																				
(j).	What do you mean by statistical quality control (SQC)?			2	5																				
Section – B																									
	Attempt any three parts of the following			10 x 3 =30																					
Q2.	Question			Marks	CO																				
(a).	Solve the partial differential equation $(D - D' - 1)(D - D' - 2) = \sin(2x + 3y)$			10	1																				
(b).	A laterally insulated bar of length has its ends A and B maintained at 0°C and 100°C respectively until steady state conditions prevail. If the temperature at B is suddenly reduced to 0°C and kept so while that of A is maintained at 0°C. Find the temperature at a distance x from A at any time t.			10	2																				
(c).	Calculate the first four central moments about the mean of the following data: <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>f</td><td>1</td><td>8</td><td>28</td><td>56</td><td>70</td><td>56</td><td>28</td><td>8</td><td>1</td></tr></table>			x	0	1	2	3	4	5	6	7	8	f	1	8	28	56	70	56	28	8	1	10	3
x	0	1	2	3	4	5	6	7	8																
f	1	8	28	56	70	56	28	8	1																
(d).	In a sample of 1000 cases, the mean of a certain test is 14 and S.D is 2.5. Assuming the distribution to be normal, find (i) How many students score between 12 and 15? (ii) How many score above 18? (iii) How many score below 8? Given $f(0.8) = 0.2881$, $f(0.4) = 0.1554$, $f(1.6) = 0.4452$, $f(2.4) = 0.4918$.			10	4																				
(e).	In an experiment on immunization of cattle from tuberculosis the following results were obtained: <table><tr><td></td><td>Affected</td><td>Unaffected</td></tr><tr><td>Inoculated</td><td>12</td><td>28</td></tr><tr><td>Not Inoculated</td><td>13</td><td>7</td></tr></table> Examine the effect of vaccine in controlling the incidence of the disease. [Given $\chi^2_{0.05,1} = 3.84$]				Affected	Unaffected	Inoculated	12	28	Not Inoculated	13	7	10	5											
	Affected	Unaffected																							
Inoculated	12	28																							
Not Inoculated	13	7																							



PAPER ID-411526

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BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATHEMATICS-IV

Section – C																									
Attempt any one part of the following								10x 1 = 10																	
Q3.	Question							Marks	CO																
(a).	Solve $(y + zx)p - (x + yz)q = x^2 - y^2$							10	1																
(b).	Solve $(x^2 D^2 - 4xy DD' + 4D'^2 + 6D')z = x^3 y^4$.							10	1																
Attempt any one part of the following								10x 1 = 10																	
Q4.	Question							Marks	CO																
(a).	Solve the following partial differential equation by using method of separation of variables: $\frac{\partial z}{\partial x} + \frac{\partial^2 z}{\partial y^2} = 0$; $z(x, 0) = 0$, $z(x, \pi) = 0$, $z(0, y) = 4 \sin 3y$.							10	2																
(b).	A string is stretched and fastened to two points l m apart. Motion is started by displacing the string in the form $u(x, 0) = A \sin \frac{\pi x}{l}$ from which it is released at time $t=0$. Show that the displacement of any point at a distance x from one end at time t is given by $u(x, t) = A \sin \frac{\pi x}{l} \cos \frac{\pi ct}{l}$.							10	2																
Attempt any one part of the following								10x 1 = 10																	
Q5.	Question							Marks	CO																
(a).	Fit a parabolic curve of regression of y on x to the following data: <table><tr><td>x</td><td>1.0</td><td>1.5</td><td>2.0</td><td>2.5</td><td>3.0</td><td>3.5</td><td>4.0</td></tr><tr><td>y</td><td>1.1</td><td>1.3</td><td>1.6</td><td>2.0</td><td>2.7</td><td>3.4</td><td>4.1</td></tr></table>							x	1.0	1.5	2.0	2.5	3.0	3.5	4.0	y	1.1	1.3	1.6	2.0	2.7	3.4	4.1	10	3
x	1.0	1.5	2.0	2.5	3.0	3.5	4.0																		
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1																		
(b).	Let the random variable X assume the value ' r ' with the probability law $p(X = r) = q^{r-1} p$; $r = 1, 2, 3, \dots$. Find the m.g.f of X and hence its mean and variance.							10	3																
Attempt any one part of the following								10x 1 = 10																	
Q6.	Question							Marks	CO																
(a).	Fit a binomial distribution for the following data and compare the theoretical frequencies with the actual ones <table><tr><td>x:</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>f:</td><td>2</td><td>14</td><td>20</td><td>34</td><td>22</td><td>8</td></tr></table>							x :	0	1	2	3	4	5	f :	2	14	20	34	22	8	10	4		
x :	0	1	2	3	4	5																			
f :	2	14	20	34	22	8																			
(b).	The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers such that i. No accident in a year ii. More than three accidents in a year. (given, $e^{-3} = 0.04979$).							10	4																
Attempt any one part of the following								10x 1 = 10																	
Q7.	Question							Marks	CO																
(a).	In two independent sample of size 8 and 10, the sum of square of deviations of the sample values from the respective means were 84.4 and 102.6. Test whether the difference of variances of populations is significant or not. Use a 5% level of significance. [$F_{0.05, (7, 9)} = 3.29$]							10	5																
(b).	An inspection of 10 samples of size 400 each from 10 lots revealed the following number of defective units: 17, 15, 14, 26, 9, 4, 19, 12, 9, 15. Draw the np -charts and state whether the process is under control or not.							10	5																



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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:

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

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(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

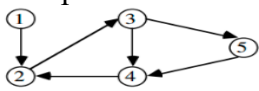


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B. TECH
(SEM III) THEORY EXAMINATION 2020-21
DATA STRUCTURES

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



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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

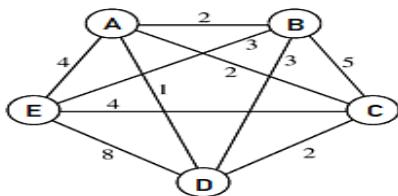
4. Attempt any one part of the following:

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



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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



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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



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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 $2^{h+1} - 1$, $h \geq 0$.	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



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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 $hgh^{-1} \in H$ 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



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B TECH
(SEM-III) THEORY EXAMINATION 2020-21
MATHEMATICS-IV

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.	What is the auxiliary equation of Charpit Method?	2	1
b.	Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$	2	1
c.	Classify the following Partial Differential Equation $4 \frac{\partial^2 u}{\partial x^2} + 4 \frac{\partial^2 u}{\partial x \partial t} + \frac{\partial^2 u}{\partial t^2} = 0$	2	2
d.	Explain the Radio Equations.	2	2
e.	The first two moments of a distribution about the value '2' of the variable are 1,16. Show that mean is 3, variance is 15.	2	3
f.	If the regression coefficient is 0.8 and 0.2, What will be the value of coefficient of Correlation.	2	3
g.	If the function $f(x)$ is defined by $f(x) = ce^{-x}$, $0 < x < \infty$ calculate the value of c which changes $f(x)$ to a probability density function.	2	4
h.	Identify the following statement is true or false "For a Binomial Distribution, mean is 6 and variance is 9.	2	4
i.	When is the test statistic $F = \frac{S_1^2}{S_2^2}$ is used?	2	5
j.	Explain the t-test for small samples.	2	5

SECTION B

2. Attempt any three of the following:

3 x 10 = 30

a.	Solve $x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2} = x^m y^n$.	10	1												
b.	Calculate the deflection $u(x,t)$ of a tightly stretched vibrating string of unit length that is initially at rest and whose initial position is given by $\sin \pi x + \frac{1}{3} \sin 3\pi x + \frac{1}{5} \sin 5\pi x, \quad 0 \leq x \leq 1$	10	2												
c.	Use the Method of Least Squares, find the curve $y = ab^x$ that best fits the following data: <table><tr><td>x</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>8.3</td><td>15.4</td><td>33.1</td><td>65.2</td><td>127.4</td></tr></table>	x	2	3	4	5	6	y	8.3	15.4	33.1	65.2	127.4	10	3
x	2	3	4	5	6										
y	8.3	15.4	33.1	65.2	127.4										
d.	State Baye's Theorem. The contents of urns I, II and III are as follows: 1 white, 2 black and 3 red balls; 2 white, 1 black and 1 red balls; 4 white, 5 black and 3 red balls. One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urn I?	10	4												
e.	From the following table regarding the color of eyes of father and son, test if the color of son's eye is associated with that of father. <table><tr><td rowspan="4">Eye color of father</td><td colspan="2">Eye color of son</td></tr><tr><td></td><td>Light</td><td>Not Light</td></tr><tr><td>Light</td><td>471</td><td>51</td></tr><tr><td>Not Light</td><td>148</td><td>230</td></tr></table> Given $\chi_{0.05}^2(1) = 3.841$	Eye color of father	Eye color of son			Light	Not Light	Light	471	51	Not Light	148	230	10	5
Eye color of father	Eye color of son														
			Light	Not Light											
	Light		471	51											
	Not Light	148	230												

SECTION C

3. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Solve the Partial Differential Equation: $D(D + D' - 1)(D + 3D' - 2)z = x^2 - 4xy + 2y^2$.	10	1
b.	Solve : $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$.	10	1



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4. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	A rod of length l with insulated sides is initially at a uniform temperature u_0 . Its ends are suddenly cooled to 0°C and are kept at that temperature. Calculate the temperature function $u(x, t)$.	10	2
b.	Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the boundary conditions, $u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin \frac{n\pi x}{l}$	10	2

5. Attempt any one part of the following:

Q. Attempt any one part of the following.

Q no.	Question	Marks	CO												
a.	Calculate the moment generating function of the discrete Binomial Distribution given by $P(x) = {}^nC_x p^x q^{n-x}$ where $(q=1-p)$. Also find the first and second moments about the mean.	10	3												
b.	<p>The following table gives age (x) in years of cars and annual maintenance cost (y) in hundred rupees.</p> <table><tr><td>x</td><td>1</td><td>3</td><td>5</td><td>7</td><td>9</td></tr><tr><td>y</td><td>15</td><td>18</td><td>21</td><td>23</td><td>22</td></tr></table> <p>Calculate the maintenance cost for a 4-year-old car after finding the regression equation.</p>	x	1	3	5	7	9	y	15	18	21	23	22	10	3
x	1	3	5	7	9										
y	15	18	21	23	22										

6. Attempt any one part of the following:

Q no.	Question	Marks	CO
a.	Show that Poisson Distribution is a particular limiting form of the Binomial Distribution when p or q is very small, and n is large enough.	10	4
b.	A sample of 100 dry battery cells tested to find the length of life produced the following results: $\bar{x}=12$ hours, $\sigma=3$ hours. Assuming the data to be normally distributed, what percentage of battery cells are expected to have life (i) more than 15 hours (ii) less than 6 hours (iii) between 10 and 14 hours.	10	4

7. Attempt any one part of the following:

Q no.	Question	Marks	CO																						
a.	<p>It is desired to compare three hospitals with regards to the number of deaths per month. A sample of death records were selected from the records of each hospitals and number of deaths was as given below. From mentioned data, determine the difference in the number of deaths per months among three hospitals:</p> <table><tr><th colspan="3">Hospitals</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>3</td><td>6</td><td>7</td></tr><tr><td>4</td><td>3</td><td>3</td></tr><tr><td>3</td><td>3</td><td>4</td></tr><tr><td>5</td><td>4</td><td>6</td></tr><tr><td>0</td><td>4</td><td>5</td></tr></table> <p>(Given: at 5% level of significance, $F_{2,12}=3.89$)</p>	Hospitals			A	B	C	3	6	7	4	3	3	3	3	4	5	4	6	0	4	5	10	5	
Hospitals																									
A	B	C																							
3	6	7																							
4	3	3																							
3	3	4																							
5	4	6																							
0	4	5																							
b.	<p>Distinguish between the np-chart and p-chart. Following is the data of defective of 10 samples of size 100 each. Construct np chart and examine whether the process is in statistical control?</p> <table><tr><th>Sample no.</th><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><th>No. of defectives</th><td>6</td><td>9</td><td>12</td><td>5</td><td>12</td><td>8</td><td>8</td><td>16</td><td>13</td><td>7</td></tr></table>	Sample no.	1	2	3	4	5	6	7	8	9	10	No. of defectives	6	9	12	5	12	8	8	16	13	7	10	5
Sample no.	1	2	3	4	5	6	7	8	9	10															
No. of defectives	6	9	12	5	12	8	8	16	13	7															



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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



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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



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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> <p><code>countSquares(1)</code> returns 1 # Only 1 is a perfect square ≤ 1</p> <p><code>countSquares(5)</code> returns 2 # 1, 4 are perfect squares ≤ 5</p> <p><code>countSquares(55)</code> returns 7 # 1, 4, 9, 16, 25, 36, 49 ≤ 55</p>	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> <p><code>alternating([10, 9, 9, 6])</code> returns <code>False</code> <code>alternating([10, 15, 8])</code> returns <code>True</code> <code>alternating([10])</code> returns <code>True</code> <code>alternating([])</code> returns <code>True</code> <code>alternating([15, 10, 9])</code> returns <code>False</code></p>	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> <p><code>searchMany([10, 17, 15, 12], 15, 1)</code> returns <code>True</code> <code>searchMany([10, 12, 12, 12], 12, 2)</code> returns <code>False</code> <code>searchMany([10, 12, 15, 11], 17, 18)</code> returns <code>True</code></p>	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.

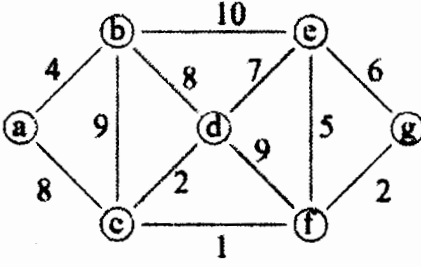
2 x 10 = 20

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 x 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 (iii) Space complexity (ii) Asymptotic Notation (iv) Big O Notation	10	CO1

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

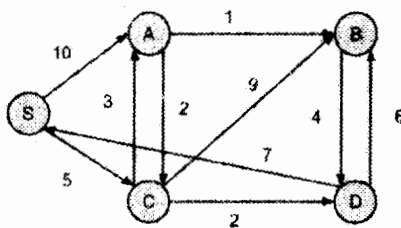
Qno.	Question	Marks	CO
a.	(i) Differentiate between iteration and recursion. (ii) Write the recursive solution for Tower of Hanoi problem.	10	CO2
b.	Discuss array and linked representation of queue data structure. What is dequeue?	10	CO2

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

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

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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:

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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:

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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
MATHEMATICS-IV

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.

$$2 \times 10 = 20$$

Q no.	Question	Marks	CO								
a.	Solve the following partial differential equation $yq - xp = z$.	2	1								
b.	Solve the Cauchy's problem $u_x - u_y = 0$. $u(x, 0) = x$	2	1								
c.	Classify the following equation. $x^2 \frac{\partial^2 u}{\partial t^2} - \frac{\partial^2 u}{\partial x^2} = u$	2	2								
d.	Solve the partial differential equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} = 0$.	2	2								
e.	Find the median of 6, 8, 9, 10, 11, 12, 13.	2	3								
f.	The first three central moments of a distribution are 0, 15, -31. Find the moment of coefficient of skewness.	2	3								
g.	If the p.m.f of a discrete random variable X is <table border="1" style="margin: 10px auto;"> <tr> <td>X</td><td>1</td><td>2</td><td>3</td></tr> <tr> <td>f(x)</td><td>$\frac{1}{2}$</td><td>$\frac{1}{3}$</td><td>$\frac{1}{6}$</td></tr> </table> Determine E(X) and V(X).	X	1	2	3	f(x)	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{6}$	2	4
X	1	2	3								
f(x)	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{6}$								
h.	The probability density function f(x) of a continuous random variable X is defined by $f(x) = \begin{cases} \frac{A}{x^2}, & 5 \leq x \leq 10 \\ 0, & \text{otherwise} \end{cases}$ Find the value of A.	2	4								
i.	Find the mean of the Binomial Distribution $B\left(4, \frac{1}{3}\right)$.	2	4								
j.	A machine which produces mica insulating washers for use in electric device to turn out washers having a thickness of 10 mm. A sample of 10 washers has an average thickness 9.52 mm with a standard deviation of 0.6 mm. Find out t.	2	5								

SECTION B

2. Attempt any *three* of the following:

$$3 \times 10 = 30$$

Q no.	Question	Marks	CO
a.	Solve $(D^2 - DD' - 2D'^2)z = (y-1)e^x$	10	1
b.	<p>A rectangular plate with insulated surface is 10 cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature along the short edge $y=0$ is given by:</p> <p>$u(x,0) = \begin{cases} 20x & 0 \leq x \leq 5 \\ 20(10-x) & 5 < x < 10 \end{cases}$</p> <p>While the two edges $x=0$ and $x=10$ as well as the other short edge are kept at 0°C. Find the steady state temperature at any point (x,y) of the plate.</p>	10	2

c.	Find an exponential curve $PV^x = k$ for the data:	10	3																								
	<table border="1"><tr><td>V</td><td>50</td><td>100</td><td>150</td><td>200</td></tr><tr><td>P</td><td>135</td><td>48</td><td>26</td><td>17</td></tr></table>	V	50	100	150	200	P	135	48	26	17																
V	50	100	150	200																							
P	135	48	26	17																							
d.	Fit a Poisson distribution to the following data which give the number of yeast cells per square for 400 squares	10	4																								
	<table border="1"><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>F</td><td>103</td><td>143</td><td>98</td><td>42</td><td>8</td><td>4</td><td>2</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> <p>It is given that $e^{-1.32} = 0.2674$.</p>	X	0	1	2	3	4	5	6	7	8	9	10	F	103	143	98	42	8	4	2	0	0	0	0		
X	0	1	2	3	4	5	6	7	8	9	10																
F	103	143	98	42	8	4	2	0	0	0	0																
e.	To test the effectiveness of inoculation against cholera, the following table was obtained	10	5																								
	<table border="1"><tr><td></td><td>Attached</td><td>Not attached</td><td>Total</td></tr><tr><td>Inoculated</td><td>30</td><td>160</td><td>190</td></tr><tr><td>Not inoculated</td><td>140</td><td>460</td><td>600</td></tr><tr><td>Total</td><td>170</td><td>620</td><td>790</td></tr></table> <p>(The figure represents the number of persons)</p> <p>Use Chi square test to defend or refute the statement. The inoculation prevents attack from cholera. The value of χ^2 for 1 degree of freedom at 5% level is 3.841.</p>		Attached	Not attached	Total	Inoculated	30	160	190	Not inoculated	140	460	600	Total	170	620	790										
	Attached	Not attached	Total																								
Inoculated	30	160	190																								
Not inoculated	140	460	600																								
Total	170	620	790																								

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

$$1 \times 10 = 10$$

Q no.	Question	Marks	CO
a.	Solve $(D + 1)(D + D' - 1)z = \sin(2x + 3y)$	10	1
b.	In a partial destroyed laboratory record of an analysis of correlation data, the following result only are legible : Variance of $x = 9$ Regression equation: $8x - 10y + 66 = 0$, $40x - 18y = 214$. What were (a) the mean value of x and y (b) the standard deviation of y and the co-efficient of correlation between x and y ?	10	3

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

$$1 \times 10 = 10$$

Q no.	Question	Marks	CO
a.	Solve $x^2 \frac{\partial^2 z}{\partial x^2} - 4y^2 \frac{\partial^2 z}{\partial y^2} - 4y \frac{\partial z}{\partial y} - z = x^2 y^2 \log y$	10	1
b.	A tightly stretched string with fixed end points $x=0$ and $x=l$ is initially in a position given by $y = y_0 \sin^3 \frac{\pi x}{l}$. If it is released from rest from this position, find the displacement $y(x,t)$.	10	2

5. Attempt any one part of the following:

$$1 \times 10 = 10$$

Q no.	Question	Marks	CO
a.	An insulated rod of length l its ends A and B maintained at 0°C and 100°C respectively until the steady state condition prevails. If B is suddenly reduced to 0°C and maintained at 0°C , Find the temperature at a distance x from A at time t .	10	2

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b.	Find the multiple regression equation of X_1 on X_2 and X_3 from the data Given below:	10	3																					
	<table><tr><td>X_1</td><td>3</td><td>5</td><td>6</td><td>8</td><td>12</td><td>10</td></tr><tr><td>X_2</td><td>10</td><td>10</td><td>5</td><td>7</td><td>5</td><td>2</td></tr><tr><td>X_3</td><td>20</td><td>25</td><td>15</td><td>16</td><td>15</td><td>2</td></tr></table>	X_1	3	5	6	8	12	10	X_2	10	10	5	7	5	2	X_3	20	25	15	16	15	2		
X_1	3	5	6	8	12	10																		
X_2	10	10	5	7	5	2																		
X_3	20	25	15	16	15	2																		

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

Q no.	Question	Marks	CO
a.	State the Bayes' theorem. The probability that a civilian can hit a target is $\frac{2}{5}$ and the probability that an army officer can hit the same target is $\frac{3}{5}$. While the civilian can fire 8 shots in the time, the army officer fires 10 shots. If they fire together, then what is the probability that army officer shoots the target?	10	4
b.	Define the Normal distribution. The daily wages of 1000 workers are distributed around a mean of Rs. 140 and with a standard deviation of Rs. 10. Estimate the number of workers whose daily wage will be (i) between Rs. 140 and Rs. 144, (ii) less than Rs. 126 (iii) more than Rs. 160.	10	4

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

Q no.	Question	Marks	CO																																				
a.	An IT company wants to appoint an effective trainer to improve the performance of their engineers. Four groups of 7, 8, 10 and 11 engineers from total 36 engineers were given 5 days training by the 4 trainers. Scores were awarded to the engineers at the end of the training on their Skills. Let us examine the preference of one engineer of one trainer over other three trainers. Given that $\alpha=0.05$ i.e. at 5% level of significance the value of $F(3,32)=3.29$.	10	5																																				
b.	Distinguish between p chart and C chart. The number of defectives in 17 samples of size 500 each from 17 lots is shown below: <table border="1" style="margin: 10px auto; width: 80%;"> <thead> <tr> <th>Sam- ples</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th><th>17</th></tr> </thead> <tbody> <tr> <td>No. of defec- tives</td><td>20</td><td>25</td><td>35</td><td>45</td><td>15</td><td>65</td><td>15</td><td>20</td><td>35</td><td>25</td><td>12</td><td>9</td><td>21</td><td>22</td><td>32</td><td>35</td><td>38</td></tr> </tbody> </table> <p>Find out the control limits for the number of defective units and also check whether the process is under control or not.</p>	Sam- ples	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	No. of defec- tives	20	25	35	45	15	65	15	20	35	25	12	9	21	22	32	35	38	10	5
Sam- ples	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17																						
No. of defec- tives	20	25	35	45	15	65	15	20	35	25	12	9	21	22	32	35	38																						

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:

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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