



Test I Examination

Programme: B. Tech.

Semester: IV

Course Code: CT-20015

Course Name: Data Communication

Branch: Computer Science and Engineering

Academic Year: 2023-24

Duration: 01 Hr.

Max Marks: 20

Student PRN No.

6 4 2 3 0 3 0 1 1

Instructions:

- Figures to the right indicate the full marks.
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Q. 1 A] Choose the correct answer from the given options. [5]

- a) _____ defines how a particular pattern to be interpreted, and what action is to be taken based on that interpretation.
a) Semantics b) Syntax c) Timing d) protocol
- b) Which layer of the OSI model provides connectivity and path selection between two end systems?
a) Physical layer b) Data link layer c) Network layer d) Transport layer
- c) If the bandwidth of a signal is 5 KHz and the lowest frequency is 52 KHz, what is the highest frequency?
a) 5 KHz b) 10 KHz c) 47 KHz d) 57 KHz
- d) A sine wave is _____.
a) periodic and continuous c) aperiodic and continuous
b) periodic and discrete d) aperiodic and discrete
- e) Baseband transmission of a digital signal is possible only if we have a _____ channel.
a) low-pass b) bandpass c) low rate d) high rate
- f) A _____ connection provides a dedicated link between two devices.
a) primary b) multipoint c) point-to-point d) secondary
- g) Which organization has authority over interstate and international commerce in the communications field?
a) FCC b) IEEE c) ITU-T d) ISOC



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- h) For a _____ channel, the Nyquist bit rate formula defines the theoretical maximum bit rate.
a) low-pass b) bandpass c) noisy d) noiseless
- i) _____ is a type of transmission impairment in which an outside source such as crosstalk corrupts a signal.
a) Noise b) Distortion c) Attenuation d) Decibel
- j) For a _____ channel, we need to use the Shannon capacity to find the maximum bit rate.
a) noiseless b) noisy c) low-pass d) bandpass

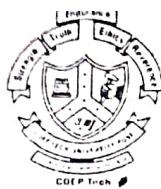
B] With the characteristics define data communication and explain their components. [3]

C] If a periodic signal is decomposed into five sine waves with frequencies of 100, 300, 500, 700, and 900 Hz, what is the bandwidth? Draw the frequency spectrum, assuming all components have maximum amplitude of 10 V. [2]

Q. 2 A] What is the difference between a port address, a logical address, a physical address and a specific address in terms of their size, which layer they are used ? [4]

- B] a) Draw the graph of the NRZ-L scheme for data stream 01010101, assuming that the last signal level has been positive.
b) Draw the graph of the Manchester scheme for data stream 00110011, assuming that the last signal level has been positive.
c) Draw the graph of the Differential Manchester scheme for data stream 01010101, assuming that the last signal level has been positive.
d) Draw the graph of the Pseudoternary scheme for data stream 01001100011, assuming that the last signal level has been positive.
e) Draw the graph of the AMI scheme for data stream 01001100011, assuming that the last signal level has been positive.
f) Draw the graph of the NRZ-I scheme for data stream 00110011, assuming that the last signal level has been positive.

C] Match the following to one of the seven OSI layer [3]
a. Format and code conversion services
b. Establishes, manages, and terminates sessions
c. Ensures reliable transmission of data
d. Log-in and log-out procedures
e. Provides independence from differences in data representation
f. Synchronization of users



Test II Examination

Programme: B. Tech.

Semester: IV

Course Code: CT-20015

Course Name: Data Communication

Branch: Computer Science and Engineering

Academic Year: 2023-24

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Q. 1 A] Choose the correct answer from the given options. [5]

- a) The electromagnetic waves ranging in frequencies between 3KHz and 1GHz are called ?
A) High frequency B) Infrared C) Micro waves D) Radio Waves
- b) Which of the following communication is used to short range of Personal Computer & Peripheral Device?
A) Radia Waves B) Micro waves C) Infrared Waves D) None
- c) Radio Waves uses which type of Propagation?
A) SKY B) Micro waves C) Ground D) Line of sight
- d) Which of the following cable consist of an inner copper core & Conduction outer sheath?
A) Optic fiber cable B) Co-Axial Cable C) Ethernet Cable D) all of these
- e) In fiber optic the signal is propagated along the inner core by?
A) Refraction B) Reflection C) Modulation D) None
- f) _____ is normally referred to as mB/nB coding; it replaces each m-bit group with an n-bit group.
A) Block coding B) Line coding C) Scrambling D) None
- g) The _____ scheme uses three levels (+V, 0, and -V) and three transition rules to move between the levels.
A) 4B5B B) 2B1Q c) MLT-3 D) None of these
- h) In _____ transmission, the frequency of the carrier signal is modulated to follow the changing voltage level (amplitude) of the modulating signal. The peak amplitude and phase of the carrier signal remain constant, but as the amplitude of the information signal changes, the frequency of the carrier changes correspondingly.
A) AM B) PM C) FM D) None of these



- i) _____ is designed to be used in wireless applications in which stations must be able to share the medium without interception by an eavesdropper and without being subject to jamming from a malicious intruder.
A) Spread spectrum B) Multiplexing C) Modulation D) None of these
- j) Circuit switching takes place at the _____ layer.
A) Data Link B) Physical C) Network D) Transport
- B] In a 3 channels are multiplexed using TDM, the data rate for each input connection is 3Kbps. If 1 bit at a time is multiplexed (i.e. a unit=1 bit), what is the duration of (a) each input slot, (b) each output slot, and (c) each frame. [3]
- OR
- C] A multiplexer combines four 100-kbps channels using a time slot of 2 bits. Show the output with four arbitrary inputs. What is the frame rate? What is the frame duration? What is the bit rate? What is the bit duration? [3]
- D] Name the advantages of optical fiber over twisted pair and coaxial cable. [2]
- Q. 2 A] What is Multiplexing? Explain Frequency and Time division multiplexing (FDM and TDM) in detail with examples/diagrams? [5]
- B] Explain Circuit Switching and Packet Switching in detail with example for each specific type? Provide diagrams for the two types of Packet Switching that is (a) datagram and (b) virtual circuit switching. [5]



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T1 Examination

(CT-20014) Data Structures and Algorithms – II

Course: B.Tech , Semester IV

Branch: Computer Engineering

Academic Year: 2023-2024

Max.Marks:20

Duration: 1 Hours

Date: 17/02/2024

Instructions:

Student MIS No.

6 4 2 3 0 3 0 1 1

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- Write your MIS Number on Question Paper

		Marks
Q 1	a Given an integer n, explain how many numbers of structurally unique binary search trees will be there which has exactly n nodes of unique values from 1 to n.	2
	b If number of nodes 'n' are given in binary tree then minimum and maximum height of the tree will be _____ and _____ respectively.	2
Q 2	a Consider the binary search tree below. Draw the binary search tree obtained after performing remove (88). Justify your answer for each solution.	2
	b Let the preorder traversal sequence of binary tree T be 100, 34, 16, 9, 8, 38, 11, 4, 81 and postorder traversal sequence be 34, 9, 11, 4, 38, 81, 8, 16, 100. If all the non-leaf nodes of T have two children, identify T. Mention all steps.	3

Q 3	a	<p>Write the output of the following function:</p> <pre>void function1(tree t) { node *p; queue q; qinit(&q); enq(&q, t); while(!qempty(&q)) { p=deq(&q); printf("%d", p->data); if(p->left) enq(&q, p->left); if(p->right) enq(&q, p->right); } printf("\n"); }</pre> <p>The tree t is a binary search tree, having data inserted in the given order: 75, 68, 89, 21, 72, 80, 96. Make suitable assumptions wherever required.</p>	2
	b	Explain construction of Expression tree to evaluate given postfix expression - Input: s = ["4", "2", "+", "3", "5", "1", "-", "*", "+"]	3
Q4	a	Write a function to display the path from root to the farthest leaf of a binary tree of integers. Assume linked implementation of the tree. Also assume all required data structures are available.	3
	b	Write an iterative function in C to insert node in a BST using linked list. Given a root node reference of a BST and a key, insert the node with the given key in the BST.	3



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T2 Examination

(CT-20014) Data Structures and Algorithms – II

Course: B.Tech , Semester IV

Branch: Computer Engineering

Academic Year: 2023-2024

Max.Marks:20

Duration: 1 Hours

Date: 19/03/2024

Instructions:

Student MIS No.

6	1	2	3	0	3	0	1	1
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- Exchange/Sharing of stationery, calculator etc. not allowed.
- Write your MIS Number on Question Paper

			Marks
Q 1	a	How many maximum and minimum nodes will be there for AVL tree of height 3?	2
	b	In given graph, find out in-degree and out-degree of 2 	2
	c	i) What is the advantage of an AVL tree over a BST? ii) Complete graph has _____ number of edges.	2
Q 2	a	i) Show the AVL tree that results after deletion of the integer keys 9 and 27. ii) Explain process to re-balance after deletion of the given keys. iii) Clearly state the imbalanced node, type of imbalance after the operation. 	4
	b	Tree contains the nodes in given order: 8, 2, 4, 3, 7, 6, 5. Show working of Heap sort to get ascending order.	4
Q 3	a	Write a function in C to perform LL rotation in AVL tree.	3
	b	Write a function in C to insert element in a max heap using array.	3

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END Semester Examination

(CT-20014) Data Structures and Algorithms – II

Course: B.Tech , Semester IV

Branch: Computer Engineering

Academic Year: 2023-2024

Max.Marks:60

Duration: 3 Hours

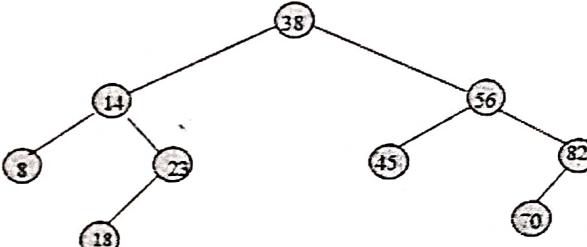
Instructions:

Student MIS No.

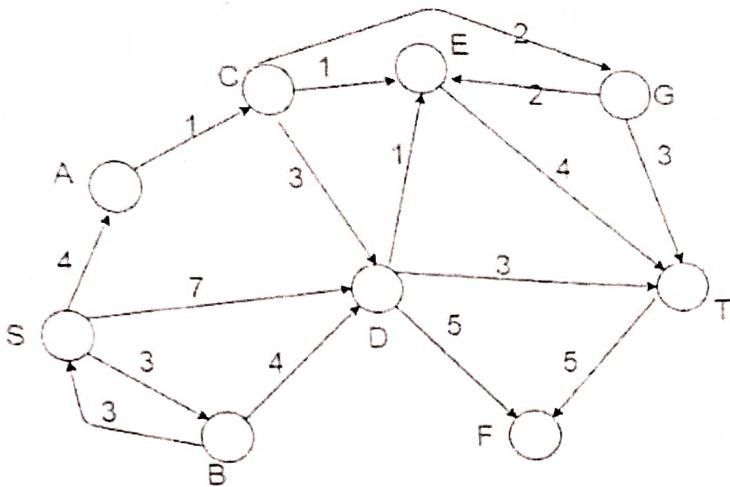
6 4 2 3 0 3 0 1 1

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5. Write your MIS Number on Question Paper

			Marks	CO	PO
Q 1	a	In a Binary Tree, how many max possible nodes can be at level=i?	1	1, 2	1, 2
	b	Identify the following function and write its output <pre>int function2(tree t) { stack a; init(&a); node *p = *t; int flag = 1; while(flag) { if(p) { push(&a, p); p = p->left; } else { if(!isEmpty(&a)) { p = pop(&a); printf("%d ", p->data); p = p->right; } else flag = 0; } } }</pre> <p>The tree t is a binary search tree, having data inserted in the given order: 75, 68, 89, 21, 72, 80, 96. Make suitable assumptions wherever required.</p>	3	1, 2	1, 2
	c	Write a C function to display nodes of a binary tree level wise using queue. Assume linked implementation of the tree.	4	3, 4	1, 3
Q 2	a	Explain construction of Expression tree for given postfix expression: ab+cde+**	3	2, 3	1, 2
	b	Write an iterative function in C to delete node from a BST using linked list.	4	3, 4	1, 3

Q 3	a	Using Heaps, delete() can be implemented using in _____ time. Explain.	2	1, 2	1, 2																													
	b	Consider the array A representing a min-heap below (only keys are shown) and answer the question that follows: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Array Index</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><td>11</td><td>12</td><td>13</td><td>14</td> </tr> <tr> <td>Key</td> <td>2</td><td>9</td><td>4</td><td>12</td><td>16</td><td>7</td><td>15</td><td>13</td><td>14</td><td>17</td><td>18</td><td>8</td><td>10</td><td>19</td> </tr> </table> Give the array after performing one removeMin() operation.	Array Index	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Key	2	9	4	12	16	7	15	13	14	17	18	8	10	19	2	1, 2
Array Index	1	2	3	4	5	6	7	8	9	10	11	12	13	14																				
Key	2	9	4	12	16	7	15	13	14	17	18	8	10	19																				
c	Write a function in C to remove element in a heap using array with the process of heapify.	5	3, 4	1, 3																														
Q4	a	What is the maximum height of any AVL-tree with 7 nodes? Assume that the height of a tree with a single node is 0.	3	2, 3	1, 2																													
	b	Consider the following AVL tree  What will be the resultant AVL tree after insertion of node with value 20?	3	2, 3	1, 2																													
	c	Write a C function to insert node in AVL Tree using a linked list of nodes of structure having balance-factor, left pointer, right pointer, and parent pointers pointing to left sub-trees, right sub tree and parent of the node respectively.	5	3, 4	1, 3																													
Q5	a	In Red Black tree, operations such as insertion and deletion take _____ time and in skewed BST, take _____ time.	2	1, 2	1, 2																													
	b	Show the Red-Black tree that results after each of the integer keys 12, 20, 6, 18, 19, 25 and 23 are inserted, in that order, into an initially empty Red-Black tree. Show each step.	3	2, 3	1, 3																													
	c i)	What will be degree of a graph G with m edges.	1	1, 2	1, 2																													
	c ii)	Given a weighted graph where weights of all edges are unique (no two edge have same weights), there is always a unique shortest path from a source to destination in such a graph. Explain. (A) True (B) False	2	1, 2	1, 2																													

Q6	a	<p>For the undirected, weighted graph given below, which of the following sequences of edges represents a correct execution of Prim's algorithm to construct a Minimum Spanning Tree? Justify your answer</p> <p>(A) - (a, b), (d, f), (f, c), (g, i), (d, a), (g, h), (c, e), (f, h) (B) - (c, e), (c, f), (f, d), (d, a), (a, b), (g, h), (h, f), (g, i) (C) - (d, f), (f, c), (d, a), (a, b), (c, e), (f, h), (g, h), (g, i) (D) - (h, g), (g, i), (h, f), (f, c), (f, d), (d, a), (a, b), (c, e)</p>	4	1, 3	1, 2
	b	<p>Consider the following graph:</p> <p>Which one of the following is not the sequence of edges added to the minimum spanning tree using Kruskal's algorithm? Justify your answer.</p> <p>(A) (b,e)(e,f)(a,c)(b,c)(f,g)(c,d) (B) (b,e)(e,f)(a,c)(f,g)(b,c)(c,d) (C) (b,e)(a,c)(e,f)(b,c)(f,g)(c,d) (D) (b,e)(e,f)(b,c)(a,c)(f,g)(c,d)</p>	4	1, 3	1, 2
	c	<p>Consider the directed graph shown in the figure below. There are multiple shortest paths between vertices S and T. Which one will be reported by Dijkstra's shortest path algorithm? Assume that, in any iteration, the shortest path to a vertex v is updated only when a strictly shorter path to v is discovered. Justify your answer.</p>	4	2, 3	1, 2



- (A) SDT
 (B) SBDT
 (C) SACDT
 (D) SACET

d Write a function in C to initialize graph, check whether graph is connected and perform DFS from a randomly selected vertex.

5 3,4 1,3



Test 1 Examination

Programme: B. Tech.

Semester: IV

Course Code: CT-20013

Course Name: Microprocessor Techniques

Branch: Computer Engineering

Academic Year: 2023-24

Duration: 1 Hour

Max Marks: 20

Date: 17/02/2024

Student PRN No.

6 | 4 | 2 | 3 | 0 | 3 | 0 | 1 | 1

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	Marks
Q 1 a What is the content of the memory locations referred, if the following program is executed? Neatly specify the memory addresses and their contents.	07
MOV BX, 6000H	
MOV DS, BX	
MOV AX, 00FCH	
SUB AX, 0105H	
MOV [BX], AX	
ADD AX, 0001H	
MOV [BX + 02], AX	
XOR AX, 0008H	
ADD BX, 0004H	
MOV [BX], AX	
SUB AL, F1H	
ADC AL, E0H	
ADD BX, 0002H	
MOV [BX], AL	
BACK: INC BX	
ADD AL, AL	
JZ OVER	
MOV [BX], AL	
JMP BACK	
OVER: MOV [BX], AX	
HLT	

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b Explain the following instruction. 02

CMP AL, BL

c Find out incorrect instruction 01

1) AND AL, 2425H

2) ADC BX, 0002H

Q 2 a Give the System design for three to eight line decoder having active low outputs, using suitable logic gates. 04

b What is the ending address for the following 04

i) 12KB memory space, if the starting address is 00000H

ii) 8KB memory space, if the starting address is 0C000H

c What is the purpose of following signals in 8086 02

i) ALE

ii) M/IO#

1 111 111 111
F F F

O



Test 2 Examination

Programme: B. Tech.

Course Code: CT-20013

Branch: Computer Engineering

Duration: 1 Hour

Date: 19/03/2024

Student PRN No.

Semester: IV

Course Name: Microprocessor Techniques

Academic Year: 2023-24

Max Marks: 20

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Marks

Q 1 a What will be the content of register SI after executing following instruction sequence?

MOV CX, 0005H

04

XOR SI, SI

MOV AX, SI

STC

AGAIN: ADC SI, AX

INC AX

LOOP AGAIN

b Assume the AX= DEAFH, DS= 5000H, SI= F00DH, BX=FEEDH, ES=4000H, DI= ABCDH SP= BF00H, SS=D000H, CS= 4000H, BP= 0440H

04

What will be the content of Stack memory and memory address of top of stack, after executing following instruction sequence?

↓
0 BE F8

PUSH SI

PUSH AX

PUSH BX

PUSH DI

c What is the starting address of 32KB EPROM space in 8086 based system?

02

P.T.O



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- Q 2 a** Encode the following instruction by referring the table given below 02
XOR BX, [SI+2040H]; assuming opcode bits for the operation XOR as 001100.

mod	00	01	10	11	
				w = 0	w = 1
r/m and reg					
000	[BX+SI]	[BX+SI+8bit]	[BX+SI+16bit]	AL	AX
001	[BX+DI]	[BX+DI+8bit]	[BX+DI+16bit]	CL	CX
010	[BP+SI]	[BP+SI+8bit]	[BP+SI+16bit]	DL	DX
011	[BP+DI]	[BP+DI+8bit]	[BP+DI+16bit]	BL	BX
100	[SI]	[SI+8bit]	[SI+16bit]	AH	SP
101	[DI]	[DI+8bit]	[DI+16bit]	CH	BP
110	[]	[BP+8bit]	[BP+16bit]	DH	SI
111	[BX]	[BX+8bit]	[BX+16bit]	BH	DI

- b** What will be the content of register BX, after executing following instructions sequence 02

MOV BX, 8086H *2115*
ADD BX, 9004H
RCL BX, 1

- c** Assume for 8086 CPU; if DS = 1000H, ES = 2000H, CS= 3000H, SS = 4000H, AX = 0042H, SI = 1400H, DI = 2500H. Flag Register = 0000H
What are the addresses of memory referred by following instruction and what will be the contents of referred registers after execution of the instruction?

SCASW *2502*

- d** What will be the content of register AX, DL and DH after executing following instruction sequence 03

.MODEL SMALL
.STACK 100
.DATA

MX DB 77H, 50H, 14H, 28H
MY DW 4455H, 5E7BH
MZ DD BEE1DEE2H

*SE
3B
44
55*

.CODE
MOV AX,@DATA
MOV DS, AX
MOV SI, OFFSET MX
MOV DI, OFFSET MY
MOV BX, OFFSET MZ
MOV AX, WORD PTR [SI+02]
MOV DL, BYTE PTR [DI+02]
MOV DH, BYTE PTR [BX]

E2

END



End Semester Examination

Programme: B. Tech

Semester: IV

Course Code: CT-20013

Course Name: Microprocessor Techniques

Branch: Computer Engineering

Academic Year: 2023-24

Duration: 3 Hours

Max Marks: 60

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	Marks	CO	PO
Q 1	Design 8086 based system having following <i>i</i>) 16 KB RAM space using 2KB RAM chips <i>ii</i>) 16 KB EPROM space using 2KB EPROM chips <i>iii</i>) 8254 Programmable Interval Timer at address FF60H onwards Give the neat system schematic using needed supporting chips and give the address range for each of the memory chips and peripheral chip.	12	CO1 PO1, PO2, PO3
Q 2 a	Consider a single 8259 PIC is configured in 8086 based system for managing interrupts from eight devices, with default interrupt priority. The CS and IP of ISR of the device interrupting on IR1 input of 8259 are available at memory address 00124H. What is the vector number to be furnished by 8259 for the interrupt request on IR6 of 8259? Support your answer with appropriate analysis work.	5	CO5 PO1, PO2, PO3,
b	Assuming 8086 flag register content as 0200H. What is the action taken by 8086, if interrupted on its INTR signal pin?	4	CO5 PO1, PO2, PO3
Q 3 a	Explain the following instructions 1) LES DI, [BX] 2) OUT DX, AL	6	CO2 PO1, PO2, PO3
b	Assume the register content as DS=2000H, ES=4000H, SS=6000H, SI=4400H, DI=3301H, How many bus cycles are needed for execution of following instruction? AND [SI + 05], AX	3	CO2 PO1, PO2, PO3

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Q 4	Answer the following	12	CO2, CO4	PO1, PO2, PO3
	i) Explain the Rate Generator Mode in PIT 8254. ii) What is the purpose of modem control signals in USART 8251? iii) Explain the use of instruction DAA with appropriate examples.			
Q 5	Write a program in 8086 assembly language to find out the number of times the character "e" occurring in the given message string "your updated class note book is the first and the best reference\$". The number should be stored at COUNT. Neatly document the program.	9	CO2, CO3	PO1, PO2, PO3
Q 6	Describe the features of DMAC 8237.	9	CO4	PO1, PO2, PO3
OR				
Q 6	Describe the operating mode 1 for PA as input and for PB as output in PPI 8255.	9	CO4	PO1, PO2, PO3



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Test 2 – 19th October, 2023

Principles of Programming Languages (PPL)

Class: - S.Y. B.Tech (Computer Engineering & Information Technology)

Year: - 2023-24

Semester: - III

Duration: - 1 hr

Max. Marks: - 20

MIS No.

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Instructions:

1. All questions are compulsory.
2. Draw diagrams wherever necessary.
3. Make sure to annotate the parse trees with necessary details.

Q1	<p>Given the following attribute grammar:</p> <p>Syntax rules:</p> <ul style="list-style-type: none">(1) $\langle \text{declare} \rangle \rightarrow \langle \text{type} \rangle \langle \text{var} \rangle = \langle \text{num} \rangle$(2) $\langle \text{type} \rangle \rightarrow \text{binary} \mid \text{decimal}$(3) $\langle \text{num} \rangle[1] \rightarrow \langle \text{num} \rangle[2] \langle \text{const} \rangle[1] \mid \langle \text{const} \rangle[2]$(4) $\langle \text{const} \rangle \rightarrow 1 0$(5) $\langle \text{var} \rangle \rightarrow X \mid Y \mid Z$ <p>Semantic rules: follows the corresponding syntax rule</p> <ul style="list-style-type: none">(1) a. $\langle \text{var} \rangle.\text{value} \leftarrow \langle \text{num} \rangle.\text{value}$ b. $\langle \text{var} \rangle.\text{type} \leftarrow \langle \text{type} \rangle.\text{type}$ c. $\langle \text{num} \rangle.\text{type} \leftarrow \langle \text{var} \rangle.\text{type}$(2) $\langle \text{type} \rangle.\text{type} \leftarrow \text{binary or decimal}$(3) a. $\langle \text{num} \rangle[1].\text{value} \leftarrow \langle \text{const} \rangle[1].\text{value} +$ if $\langle \text{num} \rangle[1].\text{type} = \text{binary}$ then $\langle \text{num} \rangle[2].\text{value} * 2$ else $\langle \text{num} \rangle[2].\text{value} * 10$ b. $\langle \text{num} \rangle[1].\text{value} \leftarrow \langle \text{const} \rangle[2].\text{value}$(4) $\langle \text{const} \rangle.\text{value} = 1 \text{ or } 0$ <p>1.1 Based on the aforementioned rules, state each semantic rule type. (synthesized, inherited, or intrinsic attribute)</p> <hr/> <p>1.2 Assume a string is given as follows.</p> <p style="text-align: center;">decimal X = 1101</p> <p>a. Draw a fully attributed parse tree including the standard parse tree, and each node attributes and their relationship to other nodes. Show the order of semantic rules evaluation at all steps.</p>	2
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Q.2.	<p>Consider the program below in a hypothetical programming language which allows global variables and a choice of static or dynamic scoping.</p> <pre> int i; program main () { i = 10; call f(); } procedure f() { int i = 20; call g(); } procedure g() { print i; } </pre> <p><u>Explain in detail what value will be printed when:</u></p> <ol style="list-style-type: none"> Static scoping is used Dynamic scoping is used. 	3
Q.3.	<p>For the given Grammar,</p> <pre> <prog> -><stmts> <stmts> -> <init> <init>;<stmts> <init> -> <type> <var> <type> <var> = <term> <type> -> int float <var> -> W X Y Z <term> -> <var> + <var> const </pre> <p>Derive the program with statements:</p> <pre> int X; int Y=X+W; int Z=const </pre> <p>Draw the parse tree for the same.</p>	5
Q.4.	<p>Draw and explain the activation record instance for the following program and highlight the positions of Top of Stack and Dynamic Links at the given instance marked by an arrow.</p> <pre> int sub(int a,int b) { int temp = a - b; return temp; } int main() { int i,j,k; i=6; j=8; k = sub(j,i); return 0; } </pre> 	5



COEP Technological University
(Formerly, College of Engineering Pune)
(A Unitary Public University of Govt. of Maharashtra)

End Semester Examination

Principles of Programming Languages (PPL)

Class: - S.Y. B.Tech (Computer Engineering & Information Technology)

Year: - 2023-24

Semester: - III

Duration: - 3 hr

Max. Marks: - 60

MIS No.

6	4	2	3	0	3	0	1	1
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Instructions:

1. All questions are compulsory.
2. Draw diagrams wherever necessary.
3. Mobile phones and programmable calculators are strictly prohibited.
4. Writing anything on the question paper is not allowed.
5. Exchange/sharing of stationery, calculator etc. is not allowed.
6. Write your MIS Number on the Question paper.
7. Assume suitable data where necessary.

Q1	<p>Imagine you are tasked with developing a software system for a complex real-time robotics application, such as autonomous navigation for a fleet of delivery robots in a large warehouse. In this scenario, you have the flexibility to choose a programming paradigm for the project. Compare and contrast at least two different programming paradigms, such as procedural, object-oriented, functional, or event-driven(advanced concept in OOP), in the context of this robotics application. Discuss the strengths and weaknesses of each paradigm. Consider a scenario where you might need to combine multiple programming paradigms within the same project. Explain the circumstances under which you would use a hybrid approach and how you would manage the interaction between these paradigms..</p>	[5]	CO-2,5	PO-1,2,3,11
Q2	<p>Imagine you are tasked with designing a new programming language to address a specific real-world problem in the field of healthcare where medical professionals need to analyze large sets of patient data, identify trends, and predict health outcomes. The data includes patient demographics, medical history, and test results. The challenge is to create a programming language that simplifies data analysis, supports predictive modeling, and ensures data privacy.</p> <p>Design a programming language for this purpose and describe the key features and characteristics of your language, including its syntax, data structures, and built-in functions. Evaluate this Language and analyze the tradeoffs that could be involved in the design.</p>	[5]	CO-1,2	PO-1,2,3,11

Q3	<p>Imagine you are developing a C++ program for an online shopping website. In your program, you need to keep track of the number of items in a customer's shopping cart. You have decided to use a variable to store this information.</p> <p>Explain the concept of variable binding in the context of this scenario. Describe how the variable is bound to a specific value and when this binding occurs. Provide a step-by-step explanation of how the value in the variable changes as the customer adds or removes items from their cart.</p> <p>Consider different types of binding and explain which type would be most appropriate for maintaining the shopping cart count. Justify your choice by discussing the advantages and disadvantages of using that binding type.</p>	[5]	CO-2, 4	PO-1,2,3, 4
Q4	<p>Given the following C program snippet:</p> <pre>#include <stdio.h> int main() { int num1 = 42; float num2 = 3.14; printf("The sum is %d\n", num1 + (int)num2); return 0; }</pre> <p>Identify and list all the lexemes present in the provided C program snippet.</p> <p>From the list of lexemes you identified, create a list of tokens. Explain how tokens are formed from lexemes.</p>	[5]	CO-2	PO-1,2,3, 4
Q5	<p>Hexadecimal numbers, often referred to as "hex" numbers, are a base-16 numbering system used in mathematics and computer science. In the hexadecimal system, there are 16 unique digits, including the standard 0-9 digits and the additional A-F characters, where A represents 10, B represents 11, C represents 12, D represents 13, E represents 14, and F represents 15.</p> <p>Each position in a hexadecimal number represents a power of 16, much like the decimal system represents powers of 10.</p> <p>Provide an example of a hexadecimal number and its representation in a denotational semantics context.</p> <p>Explain how you would evaluate the meaning of this hexadecimal number using the principles of denotational semantics.</p>	[5]	CO-2	PO-1,2,3, 4
Q6	<p>Describe the steps involved in a function call in C/C++.</p> <p>Discuss the role of the function call stack, activation records, and parameters passing during this process.</p>	[5]	CO-2, 4	PO-1,2,3, 4

Q7	<p>You are tasked with developing a simulation of a banking system in C++. To accomplish this, you need to design and implement three classes: 'Account,' 'Customer,' and 'Bank.' The 'Account' class should include attributes such as the <i>account holder's name, account number, and balance</i>, as well as <i>methods</i> for <i>depositing and withdrawing funds</i>. The 'Customer' class should contain information about the customer, including their <i>name and contact details</i>. The 'Bank' class should manage a <i>list of customer accounts</i> and provide <i>operations</i> for <i>creating new accounts, deleting accounts, transferring funds between accounts, and generating account statements</i>.</p> <p>Critically evaluate the design of these three classes in the context of the banking system simulation by specifying the data members and member functions of each class with access specifiers.</p> <p>Explain how these classes interact by using objects to simulate the banking operations effectively.</p> <p>Identify any potential design improvements, especially in terms of encapsulation, data hiding, and code reusability.</p>	[5]	CO-2, 3, 5	PO-1,2,3,4, 11,12
Q8	<p>Imagine you are working on a C++ project to develop a video game engine. The game engine will have a base class 'GameObject' that represents all objects in the game with characteristics like PlayerID, Country, Gender, Type, and various derived classes like 'PlayerCharacter' and 'EnemyCharacter.' Each game object must implement a 'Render' method to display itself on the screen. <i>PlayerCharacter</i> must display its type as a "<i>Defense</i>" whereas the type of an <i>EnemyCharacter</i> would be "<i>Attack</i>".</p> <p>Explain the concept of virtual functions in C++ and how they are used in the scenario described above.</p> <p>Describe the purpose and benefits of function overriding.</p> <p>Also discuss how it is different from function overloading.</p>	[5]	CO-2, 3, 5	PO-1,2,3,4, 11,12
Q9	<p>Imagine you are developing a C++ program to handle financial transactions. You are required to handle exceptions in various situations to ensure the program's robustness.</p> <p>In this scenario, describe a specific transaction that might result in an <i>exception</i>, such as a 'NegativeBalanceException' when an account goes below zero or an 'InsufficientFundsException' when a withdrawal exceeds the available balance.</p> <p>Provide a pseudocode to handle these exception mechanisms using 'try,' 'catch,' and 'throw'. (You can refer the example of Q7 to answer this question)</p>	[5]	CO-2, 3, 5	PO-1,2,3,4, 6, 7,8,11,12
Q10	<p>You are developing a C++ GUI application for a digital drawing program. Users can create, modify, and save drawings using various tools, such as pencils, shapes, and brushes.</p> <p>The application is responsive to mouse and keyboard events to ensure a smooth user experience.</p> <p>Discuss the key components of an event in event-driven programming. How are events typically defined, triggered, and processed in C++ applications, such as your digital drawing program?</p>	[5]	CO-2, 3, 5	PO-1,2,3,4, 11,12

Q11	<p>You are tasked with creating a Prolog program to manage a movie database. The program should store information about movies, directors, actors, and genres, and allow users to query the database for specific details.</p> <p>Some facts are as follows:</p> <p>“The shawshank redemption” is a movie of Drama genre directed by Frank Darabont in 1994, “The godfather” is a Crime classic movie directed by Francis Ford Coppola in 1972, “Pulp Fiction” is another Crime genre movie directed by Quentin Tarantino in 1994 and “The dark knight” is an Action movie directed by Christopher Nolan in 2008.</p> <p>Marlon Brando and Al Pacino are the lead actors of The Godfather. Tim Robbins and Morgan Freeman were the actors in the Shawshank redemption. Actors of Pulp Fiction and The Dark Knight are John Travolta, Uma Thurman and Christian Bale, Heath Ledger respectively.</p> <p>Write down Facts for movie,director and actor, Define Rules to find_genre and worked_with and Query in prolog to get answers for the following:</p> <ol style="list-style-type: none"> To find all movies directed by Quentin Tarantino To find all the actors in the movie "Pulp Fiction." Create a Prolog rule to associate actors who have worked_with the directors. Use this rule to get the names of actors who have worked with Christopher Nolan. 	[5]	CO-2,5	PO-1,2,3,4,5,12
Q12	Trace the Execution of the following statement in LISP:	[5]	CO-2,5	PO-1,2,3,4,5,12
	(some '(a) '(b c) '(d e))			
	<i>Given that:</i>			
	(defun some(x,y,z) (cons x (other y z))) (defun other(v w) (cons v w))			