

University of Mumbai
Examination First Half 2022
Examinations Commencing from 3rd June 2022

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: CSC301 and Course Name: Engineering Mathematics-III

Time: 2hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	In the Fourier series of $f(x) = \sqrt{1 - \cos x}$ in $(0, 2\pi)$ the value of a_0 is
Option A:	$\frac{2\sqrt{3}}{\pi}$
Option B:	$\frac{6\sqrt{2}}{\pi}$
Option C:	$\frac{2\sqrt{2}}{\pi}$
Option D:	$\frac{2\sqrt{2}}{4\pi}$
2.	The formula of complex form of Fourier series for function $f(x)$ in $(-l, l)$ is
Option A:	$\sum_{-\infty}^{\infty} C_n e^{inx}$ where $C_n = \frac{1}{2l} \int_{-l}^l f(x) e^{-in\pi x/l} dx$
Option B:	$\sum_{-\infty}^{\infty} C_n e^{in\pi x/l}$ where $C_n = \frac{1}{2l} \int_{-l}^l f(x) e^{-in\pi x/l} dx$
Option C:	$\sum_{-\infty}^{\infty} C_n e^{inx}$ where $C_n = \frac{1}{2l} \int_{-l}^l f(x) e^{-in\pi x/l} dx$
Option D:	$\sum_{-\infty}^{\infty} C_n e^{ix}$ where $C_n = \frac{1}{2l} \int_{-l}^l f(x) e^{-in\pi x/l} dx$
3.	Evaluate $\int_0^{\infty} e^{-3t} t^5 dt$
Option A:	$\frac{60}{s^5}$
Option B:	$\frac{120}{s^6}$
Option C:	$\frac{120}{729}$
Option D:	$\frac{60}{729}$
4.	If $f(z) = u + iv$ is analytic then
Option A:	u is harmonic but v may or may not be harmonic.
Option B:	v is harmonic but u may or may not be harmonic.
Option	u and v both need not be harmonic.

C:	
Option D:	u and v both harmonic.
5.	If $\text{Var}(X) = 4$ then $\text{Var}(3x+5)$ is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
6.	If X has the following probability distribution $X:$ 0 1 2 $P(X = x):$ k $2k$ $5k$ Then the value of k is
Option A:	$1/6$
Option B:	0
Option C:	$1/3$
Option D:	$1/8$
7.	Find Inverse L.T. of $\frac{3}{9s^2-16}$.
Option A:	$\frac{1}{4} \sinh\left(\frac{3t}{4}\right)$
Option B:	$\frac{1}{4} \sin\left(\frac{3t}{4}\right)$
Option C:	$\frac{1}{4} \sinh\left(\frac{4t}{3}\right)$
Option D:	$\frac{1}{4} \sin\left(\frac{4t}{3}\right)$
8.	$L^{-1}\left[\frac{1}{s(s+4)}\right]$ is
Option A:	$\frac{1}{4}(e^{-4t} - 1)$
Option B:	$\frac{1}{4}(1 - e^{-4t})$
Option C:	$(e^{-4t} - 1)$
Option D:	$\frac{1}{4}(e^{-4t} + 1)$
9.	Find the Laplace transform of $\frac{\sin t}{t}$

Option A:	$\cot^{-1}s$
Option B:	$\cot^{-1}t$
Option C:	$\tan^{-1}s$
Option D:	$\tan^{-1}t$
10.	Find $L[(\sin 3t)(\sin 5t)]$
Option A:	$\frac{1}{2} \left[\frac{s}{s^2 + 4} + \frac{1}{s^2 + 64} \right]$
Option B:	$\frac{1}{2} \left[\frac{s}{s^2 - 4} - \frac{1}{s^2 - 64} \right]$
Option C:	$\frac{1}{2} \left[\frac{s}{s^2 - 4} - \frac{s}{s^2 - 64} \right]$
Option D:	$\frac{1}{2} \left[\frac{s}{s^2 + 4} - \frac{s}{s^2 + 64} \right]$

Q2	Solve any Four out of Six	5 marks each
A	If $L\{\sin \sqrt{t}\} = \frac{\sqrt{\pi}}{2s\sqrt{s}} e^{-1/(4s)}$, find $L\{\sin 2\sqrt{t}\}$.	
B	If $v = 3x^2y + 6xy - y^3$, show that v is harmonic function and find the corresponding analytic function.	
C	If the mean of the following distribution is 16. Find m, n and variance. $X : 8, 12, 16, 20, 24$ $P(X) : 1/8, m, n, 1/4, 1/12$	
D	Evaluate the Fourier coefficients a_0 and a_n of $f(x) = \frac{1}{2}(\pi - x)$ in $(0, 2\pi)$.	
E	Find $L^{-1}\left(\log\left(1 + \frac{a}{s}\right)\right)$.	
F	The Regression lines of a sample are $x + 6y = 6$ and $3x + 2y = 10$. Find the coefficient of correlation between x and y .	
Q3	Solve any Four out of Six	5 marks each
A	Find the inverse Laplace transform of $\frac{s + 29}{(s + 4)(s^2 + 9)}$	
B	Calculate the value of rank correlation coefficient from the following data regarding marks of 6 students in Statistics and Mathematics in a test: <i>Marks : Statistics</i> : 40, 42, 45, 35, 36, 39 <i>Marks : Mathematics</i> : 46, 43, 44, 39, 40, 43	
C	By using Laplace transform, prove that $\int_0^{\infty} e^{-t} \cdot \frac{\sin^2 t}{t} dt = \frac{1}{4} \log 5$	

D	Evaluate the Fourier coefficients a_0 and b_3 of $f(x) = x$ in $(0, 2\pi)$.																
E	Show that the function, $f(z) = \sinh z$ is analytic and find $f'(z)$ in terms of z .																
F	The probability density function of a random variable X is <table border="1" style="margin-left: 20px;"> <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> </tr> <tr> <td>P(X=x)</td> <td>k</td> <td>3k</td> <td>5k</td> <td>7k</td> <td>9k</td> <td>11k</td> <td>13k</td> </tr> </table> <p>Find $P(X < 4)$, $P(3 < x \leq 6)$.</p>	X	0	1	2	3	4	5	6	P(X=x)	k	3k	5k	7k	9k	11k	13k
X	0	1	2	3	4	5	6										
P(X=x)	k	3k	5k	7k	9k	11k	13k										
Q4	Solve any Four out of Six 5 marks each																
A	Find the Fourier series for $f(x)$ in $(0, 2\pi)$ where $f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi \leq x < 2\pi \end{cases}$																
B	Using convolution theorem, find the inverse Laplace transform of $\frac{1}{(s-2)^4(s+3)}$																
C	State true or false with justification. "If two lines of regression are $x+3y-5=0$ and $4x+3y-8=0$, then the correlation coefficient is $+0.5$ ".																
D	Find $L(t e^{-3t} \cos 2t \cos 3t)$																
E	A continuous random variable has the following probability density function $f(x) = \begin{cases} \frac{x}{4} + k, & 0 \leq x \leq 2 \\ 0, & \text{elsewhere} \end{cases}$ <p>Evaluate k and $P(1 \leq X \leq 2)$</p>																
F	From the following data calculate Karl Pearson's coefficient of correlation (r) between X and Y. <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>18</td> <td>20</td> <td>34</td> <td>52</td> <td>12</td> </tr> <tr> <td>Y</td> <td>39</td> <td>23</td> <td>35</td> <td>18</td> <td>46</td> </tr> </table>	X	18	20	34	52	12	Y	39	23	35	18	46				
X	18	20	34	52	12												
Y	39	23	35	18	46												

University of Mumbai
Examination Summer 2022

Program: Computer Engineering
Curriculum Scheme: Rev2019
Examination: SE Semester III

Course Code: CSC302 and Course Name: Discrete Structures & Graph Theory

Time: 2 hours 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Let the set A is {1, 2, 3} and B is {2, 3, 4}. Then the set $A - B$ is
Option A:	{1, -4}
Option B:	{1, 2, 3}
Option C:	{1}
Option D:	{2, 3}
2.	Let R be a relation on the set A of positive integers. Determine the property of relation R, if $(x, y) \in R$ where $R = \{(x, y) \mid xy \geq 1\}$
Option A:	Anti symmetric
Option B:	Transitive
Option C:	Symmetric
Option D:	Equivalence relation
3.	The statement $(\sim Q \leftrightarrow R) \wedge \sim R$ is true when?
Option A:	Q: True R: False
Option B:	Q: True R: True
Option C:	Q: False R: True
Option D:	Q: False R: False
4.	How many two-digit numbers can be made from the digits 1 to 9 if repetition is allowed?
Option A:	9
Option B:	18
Option C:	81
Option D:	99
5.	Let P (x) denote the statement “ $x > 5$.” Which of these have truth value true?
Option A:	P (0)
Option B:	P (1)
Option C:	P (2)
Option D:	P (9)
6.	How many binary relations are there on a set S with 5 distinct elements?
Option A:	2^5
Option B:	2^{25}

Option C:	2^{10}
Option D:	2^{15}
7.	The inverse of function $f(x) = x^3 + 2$ is _____
Option A:	$f^{-1}(y) = (y - 2)^{1/2}$
Option B:	$f^{-1}(y) = (y)^{1/3}$
Option C:	$f^{-1}(y) = (y - 2)^{1/3}$
Option D:	$f^{-1}(y) = (y - 2)$
8.	When is a graph said to be bipartite?
Option A:	If it can be divided into two independent sets A and B such that each edge connects a vertex from to A to B
Option B:	If the graph is disconnected
Option C:	If the graph has at least $n/2$ vertices whose degree is greater than $n/2$
Option D:	If the graph is connected and it has odd number of vertices
9.	An algebraic structure _____ is called a semigroup.
Option A:	$(\mathbb{Q}, +, *)$
Option B:	$(\mathbb{P}, *)$
Option C:	$(\mathbb{P}, *, +)$
Option D:	$(+, *)$
10.	Condition for monoid is _____
Option A:	$(a+e)=a$
Option B:	$(a*e)=(a+e)$
Option C:	$a=(a*(a+e))$
Option D:	$(a*e)=(e*a)=a$

Q2 (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Prove that $8^n - 3^n$ is a multiple of 5 by mathematical induction, $n \geq 1$
ii.	What is a distributed lattice? Draw the hasse diagram of D_{1001} . Whether it is a distributive lattice? Find the inverses of all elements of D_{1001} .
iii.	Determine the Eulerian and Hamiltonian path, if exists, in the following graphs:
B	Solve any One 10 marks each

i.	What is a transitive closure? Find the transitive closure of R using Warshall's algorithm where $A = \{a, b, c, d, e, f\}$ & $R = \{(a, b), (b, c), (c, e), (e, f), (e, b)\}$
ii.	Let $f(x) = x + 2$, $g(x) = x - 2$ and $h(x) = 3x$ for all $x \in R$. (R is the set of real number). Find i) $f \circ g \circ h$ ii) $h \circ g \circ f$ iii) $f \circ f \circ f$

Q3 (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Let R be the following equivalence relation on the set $A = \{1, 2, 3, 4, 5, 6\}$: $R = \{(1, 1), (1,5), (2, 2), (2,3), (2, 6), (3,2), (3,3), (3,6), (4,4), (5,1), (5,5), (6,2), (6,3), (6,6)\}$ Find the partitions of A induced by R, i.e., find the equivalence classes of R.
ii.	Find truth table for the following expression & determine whether it is a tautology: $(\sim P \wedge (Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \leftrightarrow R$
iii.	In an auditorium, the chairs are to be numbered with an alphabet followed by a positive integer not exceeding 60. Find the maximum no. of chairs that can be placed in the auditorium.
B	Solve any One 10 marks each
i.	Let $(x_1 \wedge x_2) \vee (x_1 \wedge x_3) \vee (x_2 \wedge x_3)$ be the Boolean expression. Write E (x_1, x_2, x_3) in a Disjunctive & Conjunctive Normal Form.
ii.	Define minimum hamming distance. Find the code words generated by the parity check matrix H given below. $H = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

Q4 (20 Marks Each)	
A	Solve any Two 5 marks each
i.	If 5 points are taken in a square of side 2 units, show that at least 2 of them are no more than $\sqrt{2}$ units apart.
ii.	Consider (3,8) encoding function $e : B^3 \rightarrow B^8$ defined by $e(000) = 00000000$ $e(100) = 10100100$ $e(001) = 10111000$ $e(101) = 10001001$ $e(010) = 00101101$ $e(110) = 00011100$

	$e(011) = 10010101$ $e(111) = 00110001$ and let d be the $(8,3)$ maximum likelihood decoding function associated with e . How many errors can (e, d) correct?
iii.	Find the generating functions for the following sequences: a. $0, 0, 0, 1, 2, 3, 4, 5, 6, 7, \dots$ b. $6, -6, 6, -6, 6, -6, \dots$
B	Solve any One 10 marks each
i.	Define the term bijective function. Show that the mapping $f: \mathbb{R} \rightarrow \mathbb{R}$ given by i) $f(x) = 4x - 3$ & ii) $f(x) = 4x + 7$ is bijective.
ii.	Explain the following terms with suitable example: a) Incidence matrix b) Hamiltonian path c) Partition set d) Principle of inclusion & exclusion e) Commutative ring

University of Mumbai
Examinations Summer 2022

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	<p>Consider the following definition in c programming language. Which of the following c code is used to create a new node of circular linked list?</p> <pre> struct node { int data; struct node *next; } typedef struct node NODE; NODE *ptr; </pre>
Option A:	ptr = (NODE*)malloc(NODE);
Option B:	ptr = (NODE*)malloc(sizeof(NODE*));
Option C:	ptr = (NODE)malloc(sizeof(NODE));
Option D:	ptr = (NODE*)malloc(sizeof(NODE));
2.	Binary search can be performed, if data items are stored in an
Option A:	Unordered array
Option B:	Ordered array
Option C:	Unordered linked list
Option D:	Ordered linked list
3.	The equivalent postfix expression corresponding to the infix expression (A+B)*(D/C) is
Option A:	ABDC/*+
Option B:	AB+D*C/
Option C:	AB+DC/*
Option D:	ABD*+C/
4.	In the Breadth-First Search traversal of a graph, how many times does a node get visited?
Option A:	Once
Option B:	Twice
Option C:	Equivalent to number of indegree of the node
Option D:	Equivalent to number of outdegree of the node
5.	Linked lists are preferred to other data structures when
Option A:	The elements are in ascending or descending order.
Option B:	No deletion of elements needs to be performed.
Option C:	The number of elements in the list is known beforehand.
Option D:	Insertions and deletions are frequent in a list of unknown sizes.
6.	The number of null links in a binary tree with n nodes is
Option A:	n-1
Option B:	2n - 1
Option C:	2n
Option D:	n + 1
7.	In an AVL tree, difference of height in left sub-tree and right-tree for every node is
Option A:	Zero

Option B:	One
Option C:	Atmost one
Option D:	Atleast one
8.	Suppose a queue is implemented by a circular array QUEUE[0...9]. The number of elements in the queue, if FRONT = 8 and REAR = 3, will be
Option A:	3
Option B:	4
Option C:	5
Option D:	6
9.	_____ is used in implementation of recursion.
Option A:	Array
Option B:	Stack
Option C:	Queue
Option D:	Tree
10.	In an almost complete binary tree with 13 nodes, the number of leaves will be
Option A:	5
Option B:	6
Option C:	7
Option D:	8

Q2	Solve any Four out of Six 5 marks each
A	Explain different operations that can be performed on data structures.
B	Write a function to delete the last node of the circular linked list.
C	Show the steps for finding the topological sorting of the below graph. <div style="text-align: center;"> <pre> graph TD A((A)) --> B((B)) A((A)) --> C((C)) A((A)) --> D((D)) B((B)) --> E((E)) D((D)) --> C((C)) D((D)) --> E((E)) </pre> </div>
D	Write an algorithm to evaluate a postfix expression.
E	Write short note on Priority Queue.
F	Construct Binary Search Tree for the following list of elements 45 28 34 63 87 76 31 11 50 17

Q3	Solve any Two Questions out of Three 10 marks each
A	Show the result of inserting 16, 18, 5, 19, 11, 10, 13, 21, 8, 14 one at a time into an initially empty AVL tree.
B	A hash table of size 10 uses linear probing to resolve collisions. The key values are integers and the hash function used is key%10. Draw the table that results after inserting in the given order the following values: 28, 55, 71, 38, 67, 11, 10, 90, 44, 9
C	Write a program to implement Circular queue using an array.

Q4	Solve any Two Questions out of Three	10 marks each
A	Write a program to convert the given decimal number to a binary number using stack data structure.	
B	Write a program to perform the following operations on a singly linked list <ol style="list-style-type: none"> i. Insert a new node at the end of the list ii. Delete a node from the beginning of the list iii. Search for a given node iv. Display the list 	
C	Construct an expression tree for the expression $(a + b / c) + ((d * e + f) / g)$. Give the outputs when you apply preorder and postorder traversals.	

University of Mumbai
Examination 2022 under cluster __ (Lead College: _____)

Examinations Commencing from

Program: Bachelor of Engineering in Computer Engineering

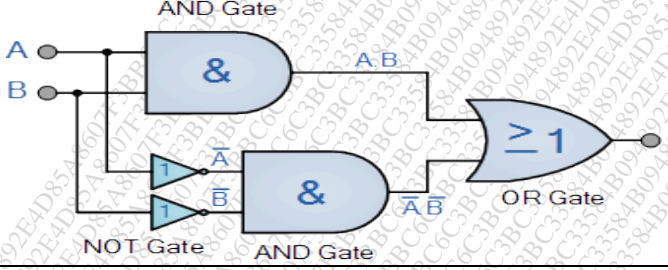
Curriculum Scheme: Rev2019

Examination: DSE Semester III

Course Code: **CSC304** and Course Name: **Digital Logic & Computer Architecture**

Time: 2 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. (2 marks each, total 20 marks)
1.	Let, $x_1 \oplus x_2 \oplus x_3 \oplus x_4 = 0$, where x_1, x_2, x_3, x_4 are Boolean variables, and \oplus is the XOR Operator. Which one of the following must always be True?
Option A:	$x_1 x_2 x_3 x_4 = 0$
Option B:	$x_1 x_3 + x_2 = 0$
Option C:	$\bar{x}_1 \oplus \bar{x}_3 = \bar{x}_2 \oplus \bar{x}_4$
Option D:	$x_1 + x_2 + x_3 + x_4 = 0$
2.	Identify the logic gate based on given equivalent circuit. 
Option A:	Ex-NOR gate
Option B:	Ex-OR gate
Option C:	NAND gate
Option D:	NOR gate
3.	The addition of -37 and $+18$ integer numbers using the 2's complement method, is
Option A:	$(11101101)_2$
Option B:	$(10101101)_2$
Option C:	$(11111101)_2$
Option D:	$(11100101)_2$
4.	Following microinstruction sequence is denote which cycle in the instructional cycle. $PC_{out}, MAR_{in}, Read, Slect4, Add, Z_{in}$ $Z_{out}, PC_{in}, Y_{in}, WMFC$ MDR_{out}, IR_{in}
Option A:	Instruction fetch
Option B:	Instruction decode
Option C:	Address calculation of Operand
Option D:	Instruction execution
5.	SDRAM stands for _____ and DDR stands for _____

Option A:	Synchronous dynamic Random-Access Memory, Double Data rate
Option B:	Synchronous dynamic Read/Write Access Memory, Double Data rate
Option C:	Static Dynamic Random-Access Memory, Dynamic Data rate
Option D:	Static Dynamic Random-Access Memory, Double Data rate
6.	Suppose that a bus has 16 data lines and requires 4 cycles of 250 nsecs each to transfer data. The bandwidth of this bus would be 2 megabytes/sec. If the cycle time of the bus was reduced to 125 n secs and the number of cycles required for transfer stayed the same. What would the bandwidth of the bus?
Option A:	1 Megabyte/sec
Option B:	2 Megabytes/sec
Option C:	4 Megabytes/sec
Option D:	8 Megabytes/sec
7.	Which of the following statement is false with respect to instruction pipeline?
Option A:	Pipelining can increase the throughput of a system.
Option B:	Pipelining partitions the system into multiple independent stages with added buffers between the stages.
Option C:	Pipelining reduce the latency of each individual instruction.
Option D:	Unbalanced lengths of pipeline stages reduces overall speedup.
8.	Select true statement from the following.
Option A:	USB is a parallel mode of transmission of data and this enables for the fast speeds of data transfers.
Option B:	In USB the devices can communicate with each other.
Option C:	The type/s of packets sent by the USB is/are Data.
Option D:	When the USB is connected to a system, its root hub is connected to the Processor BUS.
9.	32-bit PCI expansion slots on a motherboard provides speed
Option A:	Half-duplex: 33 MB/s (32-bit at 33 MHz – the standard configuration) 266 MB/s (32-bit at 66 MHz) 66 MB/s (64-bit at 33 MHz) 33 MB/s (64-bit at 66 MHz)
Option B:	Half-duplex: 133 MB/s (32-bit at 33 MHz – the standard configuration) 266 MB/s (32-bit at 66 MHz) 266 MB/s (64-bit at 33 MHz) 533 MB/s (64-bit at 66 MHz)
Option C:	Half-duplex: 166 MB/s (32-bit at 33 MHz – the standard configuration) 266 MB/s (32-bit at 66 MHz) 266 MB/s (64-bit at 33 MHz) 566 MB/s (64-bit at 66 MHz)
Option D:	Half-duplex: 128 MB/s (32-bit at 33 MHz – the standard configuration) 266 MB/s (32-bit at 66 MHz) 266 MB/s (64-bit at 33 MHz) 566 MB/s (64-bit at 66 MHz)
10.	In three-address instruction, the program to evaluate $X = (A + B) \cdot (C + D)$ is ADD R1, A, B // R1 → M[A] + M[B] // // M[X] symbolizes the memory word located at address X.// MUL X, R1, R1 // M[X] ← R1 * R2 // Missing 2 nd statement is
Option A:	ADD R1, C, D // R1 → M[C] + M[D] //
Option B:	ADD R2, C, D // R2 → M[C] + M[D] //
Option C:	ADD R3, C, D // R3 → M[C] + M[D] //
Option D:	ADD R4, C, D // R4 → M[C] + M[D] //

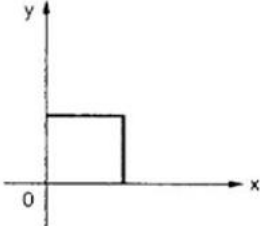
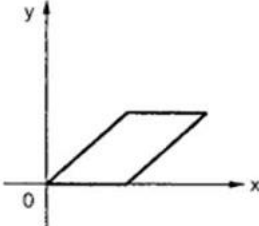
Q.2		Solve any Four out of Six.																																													
	A)	Compare the terms Computer organization with Computer architecture.	05																																												
	B)	Perform the following – i) Convert $(340)_{10}$ to excess-3 code. (1 mark) ii) Convert Hexadecimal to decimal: DADA (2 marks) iii) Hexadecimal to binary conversion: 3A9D.A0C (2 marks)	05																																												
	C)	Design a full adder using half adder and additional gates. Give its truth table.	05																																												
	D)	Give the advantages and disadvantages of hardwired control unit design using state-table method and Delay-element method.	05																																												
	E)	What is Cache Memory? A 32-bit computer has a 32 bit memory address. It has 8kB of cache memory. The computer follows four-way set associative mapping. Each line size is 16 bytes. Show the memory address format and cache memory organization.	05																																												
	F)	What is Amdahl's Law? Let a program have 40 percent of its code enhanced (so $f_E = 0.4$) to run 2.3 times faster (so $f_I = 2.3$). What is the overall system speedup S?	05																																												
Q.3		Solve any Four out of Six.																																													
	A)	Multiply $(10)_{10}$ with $(8)_{10}$ using booth's multiplication algorithm.	05																																												
	B)	Convert 39887.5625 to IEEE 64-bit Double precision floating point format.	05																																												
	C)	<p>Following diagram represents the addressing modes of processor. Considering given numerical values calculate the effective address and content of AC register value for different addressing modes as mentioned in table.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Address</th> <th>Memory</th> </tr> </thead> <tbody> <tr> <td>200</td> <td>Load to AC</td> </tr> <tr> <td>201</td> <td>Address = 500</td> </tr> <tr> <td>202</td> <td>Next instruction</td> </tr> <tr> <td>399</td> <td>450</td> </tr> <tr> <td>400</td> <td>700</td> </tr> <tr> <td>500</td> <td>800</td> </tr> <tr> <td>600</td> <td>900</td> </tr> <tr> <td>702</td> <td>325</td> </tr> <tr> <td>800</td> <td>300</td> </tr> </tbody> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Sr. no.</th> <th>Addressing Mode</th> <th>Effective address</th> <th>Content of AC</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Direct address</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Immediate Operand</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Relative address</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>Indexed address</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>Register indirect</td> <td></td> <td></td> </tr> </tbody> </table>	Address	Memory	200	Load to AC	201	Address = 500	202	Next instruction	399	450	400	700	500	800	600	900	702	325	800	300	Sr. no.	Addressing Mode	Effective address	Content of AC	1	Direct address			2	Immediate Operand			3	Relative address			4	Indexed address			5	Register indirect			05
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	D)	Write microprogram for instruction MOV A, B (copy the contents of Register B to Register A).	05
	E)	Explain with suitable diagrams, why DRAM cell required refreshing in Computer System?	05
	F)	Draw the neat block diagram for Flynn's classification.	05
Q.4	Solve any Four out of Six.		
	A)	Draw basic organization of computer and explain its block level functional units.	05
	B)	Using step by step restore division algorithmic procedure solve the following: 11 (Dividend) / 3 (Divisor).	05
	C)	Draw logic circuit diagram Master-Slave J-K flip-flop with PRESET and CLEAR inputs using NAND gates. Give its truth table and logic symbol diagram.	05
	D)	Draw and explain functioning of the microprogrammed control unit.	05
	E)	Write a short note: Interleaved and Associative memory.	05
	F)	Enlist different types of bus arbitration schemes and explain any one.	05

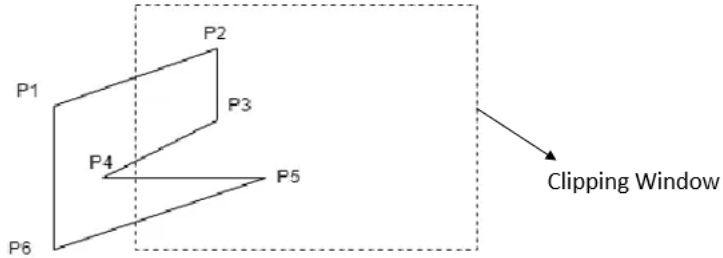
University of Mumbai
Examinations Summer 2022

Time: 2 hour 30 minutes

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	<p>The following figure is representing ----- transformation</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>(a) Original object</p> </div> <div style="text-align: center;">  <p>(b) New Object</p> </div> </div>
Option A:	X- Shear
Option B:	Y- Shear
Option C:	Translation
Option D:	Reflection
2.	----- uses beam penetration technology.
Option A:	Raster Scan Display
Option B:	Random Scan Display
Option C:	Printer
Option D:	Mouse
3.	The positive values of ' θ ' gives
Option A:	Counterclockwise Rotation
Option B:	Clockwise Rotation
Option C:	Shearing Transformation
Option D:	Reflection
4.	DDA stands for
Option A:	Digital Differential Algorithm
Option B:	Digital Differential Analyzer
Option C:	Data Differential Algorithm
Option D:	Digital Data Algorithm
5.	In mid-point ellipse drawing algorithm, the slope value at the boundary point of region 1 and region 2 is
Option A:	1
Option B:	0
Option C:	-1
Option D:	0.5
6.	<p>a. The ----- function gives the color of specified pixel b. The ----- function draws the pixel with specified color</p>
Option A:	getpixel, putpixel
Option B:	putpixel, getpixel
Option C:	getpixel, getpixel
Option D:	Putpixel, putpixel

7.	The point P(x, y) is said to be inside or on the rectangular clipping boundary if it satisfies ----- condition (where Xwmin, Ywmin , Xwmax, Ywmax represents coordinates of window boundaries)
Option A:	$X_{wmin} \leq x \leq X_{wmax}$ $Y_{wmin} \leq y \leq Y_{wmax}$
Option B:	$X_{wmin} < x < X_{wmax}$ $Y_{wmin} < y < Y_{wmax}$
Option C:	$X_{wmin} > x > X_{wmax}$ $Y_{wmin} > y > Y_{wmax}$
Option D:	$X_{wmin} > x > X_{wmax}$ $Y_{wmin} > y > Y_{wmax}$
8.	When the 3D point (x, y, z) is reflected about the YZ plane then new coordinates of the point are given by
Option A:	(-x, -y, -z)
Option B:	(x, y, z)
Option C:	(y, x, z)
Option D:	(-x, y, z)
9.	The process of extracting a portion of an image inside or outside a specified region is called
Option A:	Translation
Option B:	Shear
Option C:	Clipping
Option D:	Reflection
10.	Using -----, we can take view of an object from different directions and different distances
Option A:	Rotation
Option B:	Translation
Option C:	Scaling
Option D:	Projection

Q2. (20 Marks)	
A	Solve any Two 5 marks each
i.	Write short note on a. Character Animation b. Facial Animation
ii.	Differentiate between Bezier Curve and B-Spline curve.
iii.	Clip the following polygon $P_1P_2P_3P_4P_5P_6$ using Weiler Atherton Polygon clipping algorithm 
B	Solve any One 10 marks each
i.	Find two dimensional transformation matrix, when point $p(x,y)$ is to be reflected about a line $y=mx+c$
ii.	Explain scan line polygon fill algorithm with example.

Q3. (20 Marks)	
A	Solve any Two 5 marks each
i.	Explain super sampling and pixel phasing antialiasing techniques with example
ii.	Write short note on Rasterization and rendering
iii.	Explain fractal geometry with example
B	Solve any One 10 marks each
i.	Obtain three-dimensional composite transformation matrix for rotation about an arbitrary axis.
ii.	Clip the line segment using Cohen Sutherland line clipping algorithm. The coordinates of the window boundaries are $(x_{wmin}, y_{wmin})=(4, 4)$ and $(x_{wmax}, y_{wmax})=(10, 8)$, the coordinates of the line segment are $P1(5, 5)$ and $P2(7,7)$

Q4. (20 Marks)	
A	Solve any Two 5 marks each
i.	What is homogeneous coordinate matrix representation? Write 3-dimensional homogeneous transformation matrix for a. Translation, b. Rotation about z axis c. Scaling
ii.	Explain viewing transformation pipeline
iii.	Differentiate between parallel and perspective projection.
B	Solve any One 10 marks each
i.	Explain a. Z buffer Algorithm b. Area Subdivision method
ii.	Rasterize the line segment using Bresenham's line drawing algorithm. The endpoint coordinates of the line segment are $(X_0, Y_0) = (9, 18)$ and $(X_1, Y_1) = (14, 22)$