University of Mumbai

Examination 2021 under cluster __ (Lead College: _)

Examinations Commencing from 10th April to 17th April 2021

Program: Computer Engineering

Curriculum Scheme: Rev 2019

Examination: SE Semester III

Course Code: CSC301 and Course Name: Engineering Mathematics III

Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Laplace Transform of $e^{2t}cos2t$ is
Option A:	$\frac{s-2}{s^2-2s+8}$
Option B:	$\frac{s+2}{s^2-2s+8}$
Option C:	$\frac{s-2}{s^2+2s+8}$
Option D:	$\frac{s-2}{s^2+2s+4}$
2.	If $f(x)=\frac{1}{2}(\pi-x), 0<x<2\pi$ then a_0 is
Option A:	$\frac{2}{\pi}$
Option B:	0
Option C:	$\frac{\pi}{2}$
Option D:	$\frac{\sqrt{2}}{\pi}$
3.	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 C:	u and v both need not be harmonic.
Option D:	$u$and v both are harmonic.
4.	If Var(X) = 4 then Var(3x+4) is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
5.	If $f(x)$ is an even function in the interval $(-l,l)$ then the Fourier coefficients are

Option A:	$a_n = 0, b_n = 0.$
Option B:	$a_n = 0, a_0 = 0.$
Option C:	$b_n = 0$
Option D:	$a_0 = 0, b_n = 0$
6.	Find $L^{-1}\left(\frac{s+2}{s^2+4s+13}\right)$
Option A:	$e^{2t}cos3t$
Option B:	$e^{2t}sin3t$
Option C:	$e^{-2t}cos3t$
Option D:	$cos3t$
7.	Find an analytic function whose real part is $u = x^3 - 6x^2y^2 + y^3$
Option A:	$f(z) = z^3 + c$
Option B:	$3z^3 + c$
Option C:	$-z^3 + c$
Option D:	$3z^2 + c$
8.	Find $L^{-1}\left(\frac{1}{3s-7}\right)$
Option A:	$\frac{1}{3}\left(e^{(7/3)t}\right)$
Option B:	$\frac{-1}{3}\left(e^{(5/3)t}\right)$
Option C:	$\frac{1}{3}\left(e^{(-7/3)t}\right)$
Option D:	$\frac{1}{3}\left(e^{(5/3)t}\right)$
9.	A variate x has the following probability distribution x : -3 6 9 P(x) : 1/6 1/2 1/3 Find E(X) .
Option A:	1/2
Option B:	11/2
Option C:	3/2
Option D:	13/2
10.	If $b_{yx} = 0.7764$, $b_{xy} = 1.2321$ then coefficient of correlation
Option A:	0.9781
Option B:	0.6291
Option C:	1.2307
Option D:	0.0023
11.	Find the Laplace Transform of $\frac{cos2t-cos3t}{t}$
Option A:	$\frac{1}{2}log\left(\frac{s^2+9}{s^2+4}\right)$
Option B:	$\frac{1}{2}log\left(\frac{s^2+4}{s^2+9}\right)$

Option C:	$\frac{1}{2} log\left(\frac{s^2-4}{s^2-9}\right)$
Option D:	$\frac{1}{2} log\left(\frac{s^2-4}{s^2+9}\right)$
12.	If two variables oppose each other then the correlation will be
Option A:	Positive correlation
Option B:	Zero correlation
Option C:	Perfect correlation
Option D:	Negative correlation
13.	Parseval's identity for the function $f(x)$ in the interval $(c, c+2l)$
Option A:	$\int_c^{c+2l}[f(x)]^2 dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$.
Option B:	$\frac{1}{2l}\int_c^{c+2\pi}[f(x)]^2 dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$.
Option C:	$\frac{1}{2l}\int_c^{c+2l}[f(x)]^2 dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$.
Option D:	$\frac{1}{2\pi}\int_c^{c+2\pi}[f(x)]^2 dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$.
14.	The limits for coefficient of correlation are
Option A:	$-1 \leq r \leq 2$.
Option B:	$-1 \leq r \leq 0$.
Option C:	$-1 \leq r \leq 1$.
Option D:	$0 \leq r \leq 1$.
15.	The value of $\int_0^{\infty} e^{-2t}(1-t^2)dt$ is
Option A:	$\frac{1}{4}$
Option B:	0
Option C:	$\frac{2}{3}$
Option D:	$\frac{1}{2}$
16.	A continuous random variable X has the following probability mass function $f(x) = kx^2, 0 \leq x \leq 2$, then the value of k is
Option A:	8/3
Option B:	3/8
Option C:	1
Option D:	5/3
17.	If $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n \frac{cosnx}{n^2}$ then $a_n and\ b_n\ are$
Option A:	$a_n = 4\sum_{n=1}^{\infty}(-1)^n \frac{cosnx}{n^2}$, $b_n = 0$

Option B:	$a_n = 0, \quad b_n = 4\sum_{n=1}^{\infty}(-1)^n \frac{cosnx}{n^2}$
Option C:	$a_n = 0 b_n = \frac{\pi^2}{3}$
Option D:	$a_n = \frac{\pi^2}{3}, \quad b_n = 4\sum_{n=1}^{\infty}(-1)^n \frac{cosnx}{n^2}$
18.	Find $L^{-1}\left[log\left(\frac{s+1}{s+3}\right)\right]$.
Option A:	$\frac{-1}{t}(e^{-t} - e^{-3t})$.
Option B:	$\frac{-1}{2t}(e^{-t} - e^{-3t})$.
Option C:	$\frac{-1}{t}(e^{t} - e^{-3t})$.
Option D:	$\frac{1}{t}(e^{-t} - e^{-5t})$.
19.	Find $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$
Option A:	$\frac{1}{4}(1 - cos2t)$
Option B:	$(1 + cos2t)$
Option C:	$\frac{1}{4}(1 - sin2t)$
Option D:	$\frac{1}{4}(1 + cost)$
20.	Find the constant 'a' if $f(z) = ax^2y - y^3 + i(3xy^2 - x^3)$ is analytic
Option A:	$a = 0$
Option B:	$a = 3$
Option C:	$a = 6$
Option D:	$a = 2$

Q2. **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	Fit a straight line to the following data (X,Y) = (1,-5),(1,1),(2,4),(3,7),(4,10)
B	Find half range cosine series for $f(x) = x(\pi - x), 0 < x < \pi$
C	Find $L^{-1}\left[\frac{1}{(s+3)(s-4)^2}\right]$ using convolution theorem.
D	Find the orthogonal trajectories of the family of curves $3x^2y + 2x^2 - y^3 - 2y^2 = c$

E	A discrete random variable has p.d.f. given below X : -2 -1 0 1 2 3 P(X=x) : 0.2 k 0.1 2k 0.1 2k Find k and $(P(X \geq 1)$
F	Evaluate $\int_0^\infty \frac{e^{-t}-e^{-3t}}{t}\, dt$

Q3 . **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	Show that $u = 3x^2y - y^3$ is harmonic.Find the corresponding analytic function.
B	Find $L^{-1}\left[\frac{5s+3}{(s-1)(s^2+2s+5)}\right]$
C	Find the Fourier series for $f(x) = x^3$, in $(-\pi, \pi)$
D	Find the expectation and M.G.F. of the following distribution X : -2 3 1 P(X=x) : 1/3 1/2 1/6
E	Compute Spearman's rank correlation coefficient from the following data X : 16, 18, 25, 30, 12 Y : 38, 21, 38, 16, 50
F	Find Laplace transform of $te^{-t}\cos t$

University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Examinations Commencing from 10th April 2021 to 17th April 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev 2019

Examination: SE Semester III (For Direct Second Year-DSE)

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

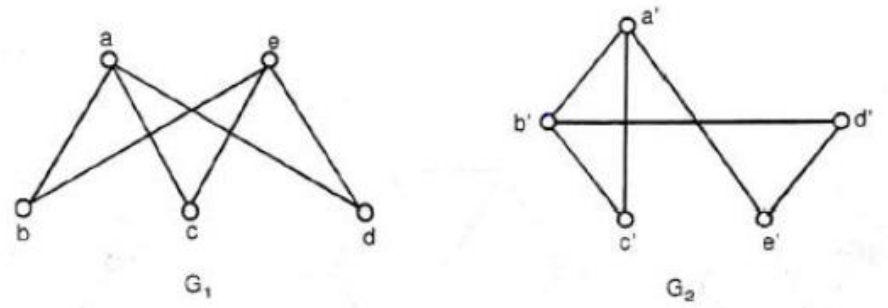
Time: 2 hour Max. Marks: 80

==========

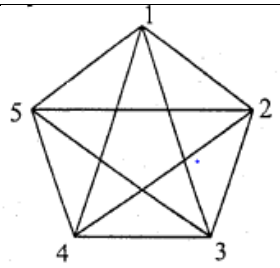
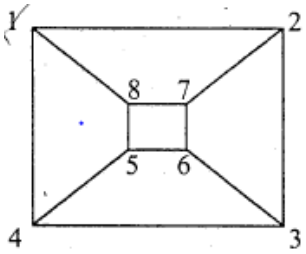
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.**
1.	What is a negation of the following statement " 8 is even & -11 is negative"?
Option A:	8 is even & -11 is not negative
Option B:	8 is odd & -11 is not negative
Option C:	8 is even or -11 is not negative
Option D:	**8 is odd or -11 is not negative**
2.	The number of elements in the P(X) of X= {{a},{b}, {c,d}, {e,f}} is
Option A:	12
Option B:	8
Option C:	9
Option D:	**16**
3.	**If two sets A and B have no common elements between them, then such sets are known as ?**
Option A:	**Disjoint**
Option B:	Intersection
Option C:	Complement
Option D:	Union
4.	Which of the following is not the example of a partial order relation?
Option A:	R={(a,b) | a,b $\in$Z, a$\leq$ b}
Option B:	R={(a,b) | a,b $\in$Z, a/b $\in$Z}
Option C:	R={(a,b) | a,b $\in$P(X) , a $\subseteq$ b}
Option D:	**R={(a,b) | a,b $\in$Z, a < b}**
5.	Let a set S = {1, 2, 3, 4, 6, 9, 12, 18, 24} and R be the partial order relation of divisibility. Number of edges in its Hasse diagram are _____
Option A:	10
Option B:	**11**
Option C:	9
Option D:	8
6.	Domain for which the functions defined by f(x) = $2x^2$-1 & g(x) = 5-x are equal to
Option A:	{2, 3/2}
Option B:	{-2, -3/2}

Option C:	{2, 3/2}
Option D:	**{-2, 3/2}**
7.	Let G be a simple undirected graph. There are some odd degree vertices. If a node x is added to G and made it adjacent to each odd degree vertex of G, then the resultant graph will be
Option A:	regular
Option B:	**Euler**
Option C:	Complete
Option D:	Hamiltonian
8.	A sufficient condition that a triangle T be a right triangle is that $a^2 + b^2 = c^2$. An equivalent statement is
Option A:	T is a right triangle unless $a^2 + b^2 = c^2$.
Option B:	If T is a right triangle then $a^2 + b^2 = c^2$.
Option C:	**If $a^2 + b^2 = c^2$ then T is a right triangle**
Option D:	T is a right triangle only if $a^2 + b^2 = c^2$.
9.	How many strings of length 8 either begin with 2 zeros or end with 4 ones?
Option A:	80
Option B:	42
Option C:	**76**
Option D:	64
10.	Let A={a,b,c,d} R={(a,a), (b,c), (c,b), (d,a)} & S={(a,d),(c,b), (b,a), (c,d)} What is the composition of relations RoS?
Option A:	{(a,a), (a,b), (c,c), (a,c)}
Option B:	**{(a,a), (b,a), (c,c), (c,a)}**
Option C:	{(a,d), (b,b), (c,a), (b,d), (d,d)}
Option D:	{(a,d), (b,b), (c,a), (d,d)}
11.	What is a length of the walk of a graph?
Option A:	Total number of edges in a graph
Option B:	**The number of edges in a walk**
Option C:	Total number of vertices in a graph
Option D:	The number of vertices in walk
12.	Which of the following statement is not a tautology?
Option A:	$p \rightarrow (p \vee q)$
Option B:	$(p \wedge q) \rightarrow (p \rightarrow q)$
Option C:	$\mathbf{(p \rightarrow q) \rightarrow q}$
Option D:	$(p \wedge q) \rightarrow (p \vee q)$
13.	Which of the following Poset is a Distributed Lattice?
Option A:	D_{50}
Option B:	$\mathbf{D_{30}}$
Option C:	D_{20}
Option D:	D_{40}

14.	Which of the following functions f: Z X Z → Z is not onto?
Option A:	f(a, b) = a – b
Option B:	f(a, b) = a + b
Option C:	**f(a, b) = | b|**
Option D:	f(a, b) = a
15.	Let A={0,1,2,3,4,5} a group under the operation of addition modulo 6 i.e. $+_6$. What is a subgroup generated by the element 2?
Option A:	{0,1,2,3,4,5,6}
Option B:	**{0,2,4}**
Option C:	{0,1,4,6}
Option D:	{2,4}
16.	If there are 25 rooms in a girls' hostel, what is the minimum number of girls required so that at least 5 are living in one room?
Option A:	85
Option B:	**101**
Option C:	100
Option D:	90
17.	What is the identity element In the group G = {2, 4, 6, 8) under multiplication modulo 10?
Option A:	5
Option B:	**6**
Option C:	12
Option D:	9
18.	Determine the number of edges in a graph with 6 nodes which contains 2 of degree 5, 2 of degree 3 & 2 of degree 2.
Option A:	12
Option B:	**10**
Option C:	9
Option D:	11
19.	For which of the following, hasse diagram is drawn?
Option A:	lattice
Option B:	**partially ordered set.**
Option C:	sublattice
Option D:	boolean algebra
20.	If 35 books in a Department contain total 56351 pages, then one of the books has atleast _____ pages.
Option A:	**1611**
Option B:	1610
Option C:	1598
Option D:	1612

Q2. **(20 Marks)**	**Solve any Four questions out of Six.** **5 marks each**
A	Let A={i, j, k, l, m} MR= $\begin{bmatrix} 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \end{bmatrix}$ Find the transitive closure of it using Warshall's algorithm.
B	Prove by mathematical induction that 2+5+8+……+(3n-1)= n(3n+1)/2
C	Explain a distributive lattice with the suitable example. Prove that in a distributive lattice, the complement of any element is unique.
D	What is a bijective function? Find inverse of the following bijection: f: R→R defined by f(x)= (1-2x)/3
E	Verify whether ((PVQ) Λ ┐(┐ P Λ (┐ Q V ┐ R))V(┐ P Λ ┐ Q)V(┐ P Λ ┐ R) is tautology.
F	Determine whether following graphs are isomorphic. Justify your answer. 

Q3. **(20 Marks)**	**Solve any Two Questions out of Three .** **10 marks each**
A	Explain the following terms with the suitable example. i) Hamming Distance ii) Monoid iii) Cyclic Group iv) group code v) Ring
B	i) What is an adjacency matrix & incidence matrix? Explain both with the suitable example. ii) What is Eulerian path & a circuit? Determine which of the following graphs consist of Eulerian path and/or a circuit.

	 G_1  G_2
C	What is a group? Let S={0,3,6,9,12} i) Prepare the composition table w.r.t. the operation of addition modulo 15. ii) Show that it is an abelian group. iii) Find the inverses of all the elements. iv) Whether it is a cyclic group?

University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE)

Examinations Commencing from 10th April 2021 to 17th April 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester: III(for Direct Second Year-DSE)

Course Code: CSC303 and Course Name: Data Structure

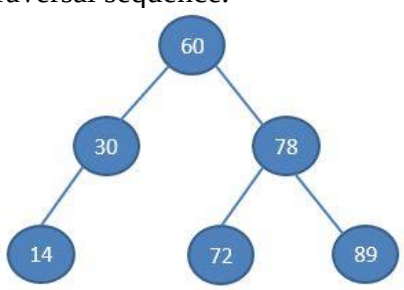
Time: 2 hour Max. Marks: 80

==========

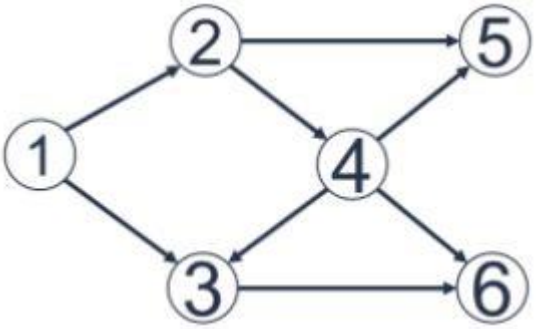
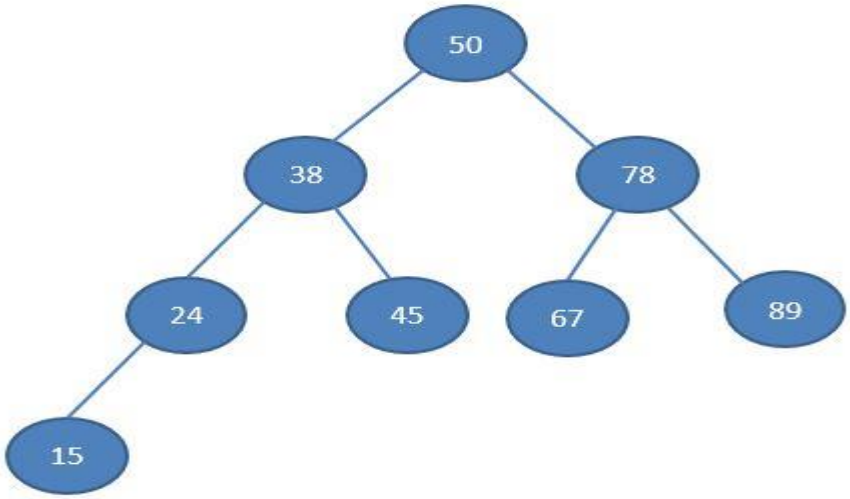
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which among the following is not a linear data structure?
Option A:	Stack
Option B:	Queue
Option C:	Tree
Option D:	Array
2.	Using division method, in a given hash table of size 114, the key 131 will be placed at position.
Option A:	31
Option B:	17
Option C:	14
Option D:	16
3.	For the implementation of parentheses balancing program using stack. What is the maximum number of parentheses that will remain on the stack [({ ( ) })] [[ ] { ([ ]) } ?
Option A:	0
Option B:	1
Option C:	2
Option D:	3
4.	Which of the following data structure is based on LIFO principle?
Option A:	Tree
Option B:	Graph
Option C:	Queue
Option D:	Stack
5.	If we insert the values 25, 14, 9, 18 and 37 in the Binary Search Tree then degree of root node will be
Option A:	0
Option B:	1
Option C:	2
Option D:	3
6.	Given the following input (22, 34, 71, 79, 89, 51, 73, 99) and the hash function x mod 10, which of the following statements are true? i) 79, 89, 99 hash to the same value

	ii) 71, 51 hash to the same value iii) All elements hash to the same value iv) Each element hashes to a different value
Option A:	i only
Option B:	ii only
Option C:	i and ii
Option D:	iii or iv
7.	What will be the front and rear of an initially empty queue after the following operations on it? enqueue(12), enqueue(10), enqueue(3), dequeue(),enqueue(18), dequeue(), enqueue(15), enqueue(15), dequeue()
Option A:	12, 15
Option B:	15, 18
Option C:	18, 15
Option D:	15, 15

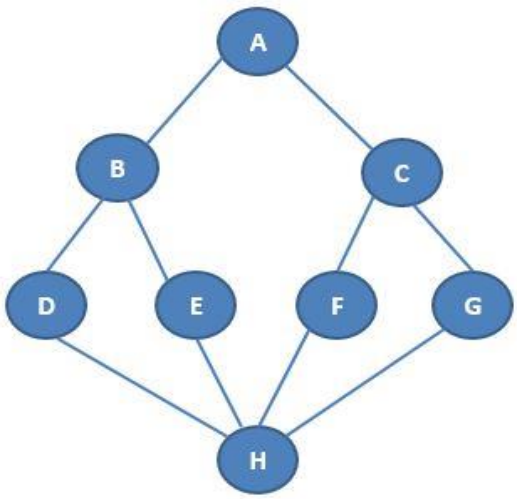
8.	In a Doubly linked list which statement is correct for dynamically allocating a memory for the node?
	`struct node`
	`{`
	`  struct node *prev;`
	`  char data;`
	`  struct node *next;`
	`};`
	`typdef struct node NODE;`
	`NODE *ptr;`

Option A:	ptr=(NODE*)malloc(sizeof(NODE));
Option B:	ptr=(NODE*)malloc(NODE);
Option C:	ptr=(NODE*)malloc(sizeof(NODE*));
Option D:	ptr=(NODE)malloc(sizeof(NODE));
9.	Which node pointers should be updated if a node B present between node A and node C of a doubly linked list is to be deleted.
Option A:	NEXT pointer of A, PREVIOUS pointer of B, NEXT pointer of C and PREVIOUS pointer of C
Option B:	NEXT pointer of A, PREVIOUS pointer of A, NEXT pointer of C and PREVIOUS pointer of C
Option C:	NEXT pointer of A, PREVIOUS pointer of C
Option D:	PREVIOUS pointer of A, NEXT pointer of C
10.	Consider the Binary Search Tree given below and find the result of in-order traversal sequence. 

Option A:	60, 30, 14, 78, 72, 89
Option B:	14, 30, 72, 89, 78, 60
Option C:	60, 30, 78, 14, 72, 89
Option D:	14, 30, 60, 72, 78, 89
11.	You are given a stack with elements 2, 5, 8, 3, 9, 10 where 10 is the top of the stack. The elements are popped one-by-one and enqueued into a queue, until the stack becomes empty. The elements are again dequeued from the queue one-by-one and pushed into the stack. What is the final arrangement of elements in the stack (from top to bottom)?
Option A:	10, 9, 3, 8, 5, 2
Option B:	2, 5, 8, 3, 9, 10
Option C:	2, 3, 5, 8, 9, 10
Option D:	10, 9, 8, 5, 3, 2
12.	Which of the following is false about a doubly linked list?
Option A:	We can navigate in both the directions
Option B:	It requires more space than a singly linked list
Option C:	The insertion and deletion of a node take a bit longer
Option D:	Implementing a doubly linked list is easier than singly linked list
13.	The Data structure used in the standard implementation of Breadth First Search is?
Option A:	Tree
Option B:	Linked List
Option C:	Queue
Option D:	Stack
14.	In the linked list implementation of a queue, where does a new element get inserted?
Option A:	At the head of the linked list
Option B:	At the tail of the linked list
Option C:	At the centre position in the linked list
Option D:	After the specified position in a linked list
15.	Which type of linked list begins with a pointer to the first node and each node contains a pointer to the next node, and the pointer in the last node points back to the first node?
Option A:	Singly linked list
Option B:	Doubly linked list
Option C:	Circular singly linked list
Option D:	Circular doubly linked list
16.	What will be the topological ordering for the below graph.

	
Option A:	1 2 3 4 5 6
Option B:	1 2 3 4 6 5
Option C:	1 3 2 4 5 6
Option D:	1 2 4 5 3 6
17.	Deletion and Insertion operation in Queue and Stack are known as?
Option A:	Enqueue and Dequeue, Push and Pop
Option B:	Push and Pop, Enqueue and Dequeue
Option C:	Pop and Push, Dequeue and Enqueue
Option D:	Dequeue and Enqueue, Pop and Push
18.	After adding a left child to the node 15 in an AVL Tree below, how many nodes will be unbalanced? 
Option A:	1
Option B:	2
Option C:	3
Option D:	4
19.	Degree of a leaf node is _____.
Option A:	0
Option B:	1
Option C:	2
Option D:	3
20.	When the left sub-tree of the tree is one level higher than that of the right sub-tree, then the balance factor is
Option A:	0

Option B:	1
Option C:	-1
Option D:	2

Q2	**Solve any Four out of Six** **5 marks each**
A	What is Data Structure? List different data structures along with applications.
B	Write an algorithm to check the well-formedness of parenthesis in an algebraic expression using Stack data structure.
C	Write functions in 'C' for the following operations of Input Restricted Deque. i) insert_right() ii) delete_left() iii) delete_right()
D	Make a comparison between linked list and linear array. Which one will you prefer to use and when?
E	Construct Huffman tree and determine the code for each symbol in the string "SUCCESSFUL".
F	Show Depth First Search traversal for the following graph with all the steps. 

Q3	**Solve any Two Questions out of Three** **10 marks each**
A	Write a program to perform the following operations on doubly linked list: i) Insert a node in the beginning ii) Delete a node from the end iii) Search for a given element in the list iv) Display the list
B	Insert the following elements in an AVL tree: 25, 44, 58, 15, 19, 11, 37, 32. Explain different rotations that can be used.
C	Using modulo division method, hash the following elements in a table of size 10. Use Linear probing and Quadratic probing to resolve the collisions. 28, 55, 71, 67, 11, 10, 90, 44

University of Mumbai

Examination 2020 under cluster __(Lead College: _____)

Examinations Commencing from 10th April 2021 to 17th April 2021

Program: Bachelor of Engineering in Computer Engineering

Curriculum Scheme: Rev2019

Examination: DSE SemesterIII

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

Time: 2 hour Max. Marks: 80

==========

<table>
<tr><td>Q1.</td><td>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>1.</td><td>Which of the following options represents the correct matching?
<table>
<tr><th>Addressing Mode</th><th>Description</th></tr>
<tr><td>1. Immediate</td><td>A. the address field refers to the address of a word in the memory, which in-turn contains the address of the operand</td></tr>
<tr><td>2. Direct</td><td>B. the address field contains the address (in main memory) where the operand is stored</td></tr>
<tr><td>3. Indirect</td><td>C. operand value is present in the instruction itself (address field)</td></tr>
<tr><td>4. Register Direct</td><td>D. the address field of the operand is a register</td></tr>
</table></td></tr>
<tr><td>Option A:</td><td>1->A; 2->D; 3->C; 4->B;</td></tr>
<tr><td>Option B:</td><td>1->C; 2->B; 3->D; 4->A;</td></tr>
<tr><td>Option C:</td><td>1->C; 2->B; 3->A; 4->D;</td></tr>
<tr><td>Option D:</td><td>1->A; 2->D; 3->B; 4->C;</td></tr>
<tr><td></td><td></td></tr>
<tr><td>2.</td><td>Consider an example of memory organization as shown in the figure below. Which value will be loaded into the accumulator when the instruction “LOAD DIRECT 3” is executed?
<table>
<tr><td>Memory Location address</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></tr>
<tr><td>Content</td><td>10</td><td>23</td><td>25</td><td>20</td><td>12</td><td>3</td><td>1</td><td>2</td></tr>
</table></td></tr>
<tr><td>Option A:</td><td>3</td></tr>
<tr><td>Option B:</td><td>25</td></tr>
<tr><td>Option C:</td><td>12</td></tr>
<tr><td>Option D:</td><td>20</td></tr>
<tr><td></td><td></td></tr>
<tr><td>3.</td><td>For a 0-address instruction format, what would be the top element of the stack following sequences of instructions? PUSH 20; PUSH 5; PUSH 5; ADD; SUB; PUSH 20; MULT</td></tr>
</table>

Option A:	100
Option B:	200
Option C:	10
Option D:	5
4.	What is the value of n in Booth's multiplication of 110* 1000?
Option A:	2
Option B:	3
Option C:	4
Option D:	0
5.	In restoring division algorithm, after performing operations (1) left shift operation on A,Q and (2) A=A-M, if magnitude of A > 0 then ?
Option A:	Q0=0, A=A+M
Option B:	A=A+M
Option C:	Q0=1
Option D:	A=A-M
6.	In non-restoring division algorithm, after performing left shift operation on A, Qregisters,if magnitude of A < 0 then?
Option A:	Q0=0, A=A+M
Option B:	A=A+M
Option C:	Q0=1
Option D:	A=A-M
7.	In single precision, IEEE754 floating point standard exponent represent by ___bits and mantissa represent by _____ bits.
Option A:	8, 23
Option B:	7, 24
Option C:	7, 23
Option D:	8, 24
8.	How many bits of opcode is required to implement a CPU with 10 arithmetic and logical instructions, 2 control instructions, and 5 data transfer instructions?
Option A:	2
Option B:	3
Option C:	4
Option D:	5
9.	In a J-K flip-flop, if J=K the resulting flip-flop is referred to as _____
Option A:	D flip-flop
Option B:	S-R flip-flop
Option C:	T flip-flop
Option D:	S-K flip-flop

10.	The instruction read from memory is then placed in the_____ and contents of program counter is_____ so that it contains the address of_____ instruction in the program.
Option A:	Program counter, incremented and next
Option B:	Instruction register, incremented and previous
Option C:	Instruction register, incremented and next
Option D:	Address register, decremented and next
11.	Which is the simplest method of implementing hardwired control unit?
Option A:	State Table Method
Option B:	Delay Element Method
Option C:	Sequence Counter Method
Option D:	Using combinational Circuits
12.	Which instruction does the following set of micro-operations refer to: Steps Action 1 PCout, MARin, Read, Select4, Add, Zin 2 Zout, PCin, Yin, WMFC 3 MDRout, IRin 4 R1out, Yin 5 R2out, SelectY, Add, Zin 6 Zout, R1in, End
Option A:	ADD R2, R1
Option B:	ADD R1, R2
Option C:	MOVE R1, R2
Option D:	MOVE R2, R1
13.	Which of the following statements is false?
Option A:	Diagonal micro-instructions encoding requires multiple decoders.
Option B:	In vertical micro-instructions encoding, more than one control signals cannot be activated at a time.
Option C:	Horizontal micro-instructions encoding has a lower cost of implementation.
Option D:	On one end of a spectrum, a *vertical* microinstruction is highly encoded and may look like a simple macroinstruction containing a single opcode field and one or two operand specifiers.
14.	In _____ mapping, the data can be mapped anywhere in the Cache Memory.
Option A:	Associative
Option B:	Direct
Option C:	Set Associative
Option D:	Indirect
15.	A second factor in locality of reference is the presence of loops in programs. Instructions in a loop, even when they are far apart in spatial terms, are executed repeatedly, resulting in a high frequency of reference to their addresses. This characteristic is referred to as

	_____.
Option A:	Spatial locality.
Option B:	temporal locality
Option C:	branch locality.
Option D:	Equidistant locality
16.	_____ consists essentially of internal flip-flops that store the binary information.
Option A:	Static RAM
Option B:	Dynamic RAM
Option C:	PROM
Option D:	EEPROM
17.	SIMD represents an organization that _____.
Option A:	refers to a computer system capable of processing several programs at the same time.
Option B:	represents organization of single computer containing a control unit, processor unit and a memory unit.
Option C:	includes many processing units under the supervision of a common control unit.
Option D:	similar to Von Neumann architecture.
18.	In parallelization, if P is the proportion of a system or program that can be made parallel, and 1-P is the proportion that remains serial, then the maximum speedup that can be achieved using N number of processors is 1/((1P)+(P/N). This law is called _____
Option A:	Newton's law
Option B:	Ohms law
Option C:	Amdahl's law
Option D:	Flynn's law
19.	To resolve the clash over the access of the system BUS we use _____
Option A:	Multiple BUS
Option B:	BUS arbitrator
Option C:	Priority access
Option D:	DMA controller
20.	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.

Q.2 Solve any Four out of Six.

a)	Briefly describe the Von Neumann Model computer architecture.	**5**
b)	Write a short note on Interleaved and Associative Memory.	**5**
c)	Differentiate between hardwired control unit and Microprogrammed Control unit.	**5**
d)	What is meaning of delayed branch and branch prediction? Write a difference between them.	**5**
e)	Draw and explain instruction cycle state diagram.	**5**
f)	Multiply (-10) and (-8) using Booth's algorithm.	**5**

Q.3 Solve any Two out of Three.

a)	Draw the flowchart of Restoring Division Algorithm & perform 10 /3 using this Algorithm.	**10**
b)	Explain with suitable diagrams - Flynn's Classification of Computer Architecture.	**10**
c)	Consider a Cache memory of 16 words. Each block consists of 4 words. Size of the main memory is 128 bytes. Draw the Associative Mapping and Calculate the TAG and WORD size.	**10**

University of Mumbai

Examination 2020 under cluster __ (Lead College: _____)

Examinations Commencing from 10th April 2021 to 17th April 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester III(for Direct Second Year-DSE)

Course Code: CSC305 and Course Name: Computer Graphics

Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which one of the following is the primarily used input device?
Option A:	Keyboard
Option B:	Scanner
Option C:	Monitor
Option D:	Speaker
2.	The midpoint ellipse drawing algorithm uses ---------- to find the pixel points along the ellipse path
Option A:	8-way symmetry
Option B:	4-way symmetry
Option C:	2- way symmetry
Option D:	6 – way symmetry
3.	Quality of the picture is
Option A:	directly proportional to the density of pixels on the screen.
Option B:	dependent on the size of a screen
Option C:	not proportional to the density of pixels on the screen
Option D:	not dependent on the number of pixels
4.	The aliasing effect can be minimized by
Option A:	decreasing resolution of the raster display
Option B:	By increasing slope of the line
Option C:	increasing resolution of the raster display.
Option D:	By decreasing slope of the line
5.	In DDA algorithm, if slope of the line is less than or equal to one (m<=1) then the next pixel point along the line path is calculated by
Option A:	Taking unit steps along the positive x direction and adding slope value to the previous y coordinate value
Option B:	Adding and subtracting slope value from the previous x and y coordinate value
Option C:	Taking unit steps along the positive x direction and y direction
Option D:	Taking unit steps along the positive x direction and subtracting slope value to the previous y coordinate value
6.	Which of the following is the correct representation to define 2D point using homogeneous coordinate [Hint: - (Xw, Yw, w)]
Option A:	(0,0,0)
Option B:	(4,4,0)

Option C:	(0,0,1)
Option D:	(1.5,1.8,0)
7.	If the scaling factors values of Sx and Sy = 1 then
Option A:	Size of an object remains same
Option B:	Size of an object is increased
Option C:	Size of an object is reduced
Option D:	It slants the shape of an object
8.	The negative values of 'θ' gives
Option A:	Anticlockwise Rotation
Option B:	Clockwise Rotation
Option C:	Shearing Transformation
Option D:	Reflection
9.	When the 3D point (x, y, z) is reflected about the XY 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)
10.	In Cohen Sutherland line clipping algorithm, if Bit code for two endpoints of the line segment is 0101 and 1001 respectively then line is
Option A:	Partially visible
Option B:	Completely visible
Option C:	Completely Inside the clipping boundary
Option D:	Completely Outside the clipping boundary
11.	----------is known as generalized line clipping algorithm
Option A:	Liang Barsky line clipping algorithm
Option B:	Cohen Sutherland line clipping algorithm
Option C:	Digital Differential Analyzer algorithm
Option D:	Bresenham's line drawing algorithm
12.	---------- defines where the object will be displayed on computer screen
Option A:	Window
Option B:	Viewport
Option C:	Frame buffer
Option D:	World coordinate system
13.	It is the process of changing position of an object along the circular path from one coordinate location to other
Option A:	Translation
Option B:	Rotation
Option C:	Scaling
Option D:	Reflection

14.	In 3 D translation, translation factors Tx, Ty, Tz are ---------- in to the original coordinates of the polygon
Option A:	Added
Option B:	Subtracted
Option C:	Multiplied
Option D:	Divided
15.	In 3D rotation about z- axis, the value of the z coordinate of new object
Option A:	is doubled
Option B:	zero
Option C:	remains same
Option D:	decreases
16.	The Surfaces of an object which are oriented away from the viewer are called as
Option A:	Back surfaces
Option B:	Front surfaces
Option C:	Top surfaces
Option D:	Side surfaces
17.	Consider equation of the plane, Ax + By+ Cz + D = 0 If Ax + By +Cz + D > 0, then point (x, y, z)
Option A:	lies in the background
Option B:	lies in the foreground
Option C:	lies anywhere
Option D:	lies on the plane
18.	In Z buffer algorithm ----------is used I. Z buffer II. Frame buffer III. Vector refresh buffer
Option A:	Only I
Option B:	Only II
Option C:	Only III
Option D:	Both I and II
19.	---------- figures are manipulated to appear as moving images
Option A:	Animation
Option B:	Rotation
Option C:	Translation
Option D:	Scaling
20.	It is a process that are applied in the animation evaluation and do not make permanent changes to the original object
Option A:	Facial animation
Option B:	Motion capture
Option C:	Deformation
Option D:	Character animation

Q2. **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	Rasterize the line segment using DDA line drawing algorithm. The two endpoint coordinates of the line segment are P1(0,0) and P2(5, 2)
ii.	Scale the square ABCD with coordinates A (0,0), B (5,0), C (5,5), D (0,5) by 3 units in x direction and 4 units in y direction
iii.	Define the following terms with example a) Scan Conversion b) Frame buffer
B	**Solve any One** **10 mark each**
i.	Clip the line segment using Cohen Sutherland Line clipping Algorithm, The Coordinates of the line segment are P1(-1, 5) and P2(3, 8) and coordinates of the window boundaries are (Xwmin, Ywmin) = (-3, 1) and (Xwmax, Ywmax) = (2, 6)
ii.	What is visible surface detection? Explain Area subdivision method with example

Q3. **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	What is homogeneous transformation matrix for 2D. Write homogeneous transformation matrix for Translation, Rotation and Scaling in terms of P'=P*T (Where P= Original object matrix, and P'=New object matrix and T= 2D transformation matrix)
ii.	What is an Animation? Write and explain principles of animation?
iii.	A point has coordinates in the x, y, z direction i.e., P (4, 5, 6). The translation is done in the x-direction and y direction by 2 units and 5 units in the z- direction. Shift the point and find the new coordinates of the point.
B	**Solve any One** **10 mark each**
i.	What is World Coordinate System (WCS) and Physical Device Coordinate System (PDCS)? Obtain viewing transformation matrix to map WCS on to PDSCS
ii.	Derive and explain midpoint ellipse drawing algorithm

University of Mumbai

Examination 2020 under cluster __ (Lead College: _____)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev 2019

Examination: Second Year Semester III

Course Code: CSC301 and Course Name: Engineering Mathematics-3

Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Laplace transform of $\cos\left(\sqrt{3}\,t\right)$is
Option A:	$\frac{s}{s^2+9}$
Option B:	$\frac{s}{s^2-9}$
Option C:	$\frac{s}{s^2+3}$
Option D:	$\frac{s}{s^2-3}$
2.	The value of $\int_0^\infty e^{-3t}\left(\frac{\sinh t}{t}\right)\,dt$ is
Option A:	$\frac{1}{3}ln\,3$
Option B:	$\frac{1}{3}\,ln\left(\frac{1}{3}\right)$
Option C:	$\frac{1}{2}ln\,2$
Option D:	$\frac{1}{2}\,ln\left(\frac{1}{2}\right)$
3.	Laplace transform of $f(t)=t^2e^{-t}$ is
Option A:	$\frac{2}{(s-1)^3}$
Option B:	$\frac{2}{(s+1)^3}$

Option C:	$\frac{\Gamma(2)}{(s-1)^3}$
Option D:	$\frac{\Gamma(2)}{(s+1)^3}$
4.	Laplace transform of $\int_0^t \sin 2t \; cosh2t \; dt$ is
Option A:	$\frac{1}{s}\left[\frac{1}{(s-2)^2-4}-\frac{1}{(s+2)^2-4}\right]$
Option B:	$\frac{1}{s}\left[\frac{1}{(s-2)^2-4}+\frac{1}{(s+2)^2-4}\right]$
Option C:	$\frac{1}{s}\left[\frac{1}{(s-2)^2+4}-\frac{1}{(s+2)^2+4}\right]$
Option D:	$\frac{1}{s}\left[\frac{1}{(s-2)^2+4}+\frac{1}{(s+2)^2+4}\right]$
5.	Inverse Laplace transform of $\frac{s-1}{s^2}$ is
Option A:	$-1-t$
Option B:	$-1+t$
Option C:	$1+t$
Option D:	$1-t$
6.	$L^{-1}\left[\frac{s+2}{s^2+4s+5}\right]$ is
Option A:	$e^{-2t}\,cost$
Option B:	$e^{-2t}\,sin\,t$
Option C:	$e^{2t}\,cos\,t$
Option D:	$e^{2t}\,sin\,t$
7.	$L^{-1}(tan^{-1}s)$ is
Option A:	$\frac{sin\,t}{t}$
Option B:	$\frac{cos\,t}{t}$
Option C:	$-\frac{sin\,t}{t}$
Option D:	$-\frac{cos\,t}{t}$

8.	$L^{-1}\left[\frac{s(2s^2-3)}{(s^2+1)(s^2-4)}\right]$ is
Option A:	$cosh\ t + cosh\ 2t$
Option B:	$cos\ t + cosh\ 2t$
Option C:	$cos\ t + cos\ 2t$
Option D:	$cosh\ t + cos\ 2t$
9.	Fourier coefficient a_2 for f(x)=x , x belongs to (-1, 1) is
Option A:	-1
Option B:	1
Option C:	0
Option D:	2
10.	Fourier coefficient b_1 for $f(x) = x.sinx$, where $x \in (0\ , 2\pi\ )$ is
Option A:	0
Option B:	π
Option C:	$-\pi$
Option D:	$\frac{\pi}{\sqrt{2}} - \frac{\pi}{\sqrt{3}}$
11.	Fourier coefficient $a_0$in half range cosine series for $f(x) = e^x, x \in (0,1)$ is
Option A:	e+1
Option B:	-e-1
Option C:	-e+1
Option D:	e-1
12.	Value of constant real number m such that $f(z) = f(x + iy) = e^{3mx+2iy}$ is analytic function is
Option A:	2/3
Option B:	-2/3
Option C:	3/2
Option D:	-3/2

13.	For real variables x, y function $u(x, y) = 2xy$
Option A:	does not satisfy Laplacian equation.
Option B:	is not continuous.
Option C:	is harmonic.
Option D:	is continuous but not partially differentiable.
14.	For $f(z) = sinx\ cosh(y) + i\ cosx$ sinh (y) , where $z = x + iy$, $f'(z)$ is
Option A:	$-sin\ z$
Option B:	$sinh\ z$
Option C:	$cos\ z$
Option D:	$cosh\ z$
15.	If coefficients of correlation between variables x, y is 0.5 and coefficient of regression b_{xy} is 0.2 then coefficient of correlation b_{yx} is
Option A:	1.25
Option B:	-1.25
Option C:	2.5
Option D:	-2.5
16.	If a straight line is y=ax+b is fitted to following data x | 0 | 1 | 2 | 3 | 4 y | 1 | 2 | 3 | 4 | 5 Then values of a & b are
Option A:	a=1, b=0
Option B:	a=1, b=1
Option C:	a=0, b=1
Option D:	a=-1, b=1
17.	The coefficient of rank correlation between two variables with unequal ranks is - 0.9 . If the number of pairs is 5 ,then the sum of squares of differences in ranks is
Option A:	37
Option B:	36
Option C:	39
Option D:	38

<table>
<tr><td></td><td></td></tr>
<tr><td>18.</td><td>If random variable X has the probability distribution as
<table>
<tr><td>X</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr>
<tr><td>P(X=x)</td><td>3k</td><td>2k</td><td>2k</td><td>k</td><td>0.2</td></tr>
</table>
Then P(-2<X ≤ 2) is</td></tr>
<tr><td>Option A:</td><td>1</td></tr>
<tr><td>Option B:</td><td>0.7</td></tr>
<tr><td>Option C:</td><td>0.8</td></tr>
<tr><td>Option D:</td><td>0.5</td></tr>
<tr><td></td><td></td></tr>
<tr><td>19.</td><td>A random variable X has probability distribution with E(X) =1.5 , E(X^2) =3 then then variance is</td></tr>
<tr><td>Option A:</td><td>0.75</td></tr>
<tr><td>Option B:</td><td>1.5</td></tr>
<tr><td>Option C:</td><td>3</td></tr>
<tr><td>Option D:</td><td>5.25</td></tr>
<tr><td></td><td></td></tr>
<tr><td>20.</td><td>A continuous random variable X has the probability law $f(x) = k^2x^3$, $0 \le x \le 3$, $k > 0$ then value of k is</td></tr>
<tr><td>Option A:</td><td>2/81</td></tr>
<tr><td>Option B:</td><td>4/81</td></tr>
<tr><td>Option C:</td><td>4/9</td></tr>
<tr><td>Option D:</td><td>2/9</td></tr>
</table>

<table>
<tr><td>Q2
(20 Marks)</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Find Laplace transform of $f(t) = sin^2t\ cos^3t.$</td></tr>
<tr><td>B</td><td>Using convolution theorem find the inverse Laplace transform of $$\emptyset(s) = \frac{s}{s^4 - 1}$$</td></tr>
<tr><td>C</td><td>Find Fourier series of $f(x) = x\ sinx$ in$(-\pi, \pi)$.</td></tr>
<tr><td>D</td><td>Find an analytic function $\omega = f(z) = u + iv, where\ z = x + iy$, whose real part is $u(x, y) = x^2 - y^2 + 2y - \sin(x)\,.\sinh(y)$</td></tr>
<tr><td>E</td><td>Calculate Spearman’s coefficient of rank correlation and Pearson’s coefficient of correlation from the following data on height and weights of 5 students.
<table>
<tr><td>Height(in inches)</td><td>61</td><td>63</td><td>65</td><td>67</td><td>69</td></tr>
<tr><td>Weight(In kgs)</td><td>64</td><td>62</td><td>65</td><td>70</td><td>72</td></tr>
</table></td></tr>
</table>

F	The warranty of electronic device in thousand of days has the density function $f(x) = \begin{cases} 4e^{-4x}, x > 0 \\ 0, \quad otherwise \end{cases}$ Find the expected warranty of the device.

Q3 (20 Marks)	**Solve any Four out of Six** **5 marks each**
A	Given $f(t) = \begin{cases} 4, & 0 \le x < 3 \\ 0, & x > 3 \end{cases}$. Find $L[f(t)]$, $L[f'(t)]$.
B	Find inverse Laplace transform of $\emptyset(s) = \frac{3s^2+11s+11}{s^3+6s^2+11s+6}$
C	Find half range sine series for $f(x) = e^{-x}$, $0 < x < 1$.
D	In the polar coordinates, let $\omega = u + iv$, $u(r,\theta) = r^2 sin2\theta$. Show that u satisfies Laplace's equation and find $v(r,\theta)$.
E	Fit a second degree parabolic curve to the following data. x: 0, 1, 2, 3, 4, 5, 6 y: 1, 1, 3, 7, 13, 21, 31
F	A random variable X has the probability distribution $P(X = x) = \frac{1}{16}\left(4_{C_x}\right)$, $x = 0,1,2,3,4$.Write Probability distribution and find standard deviation.

University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

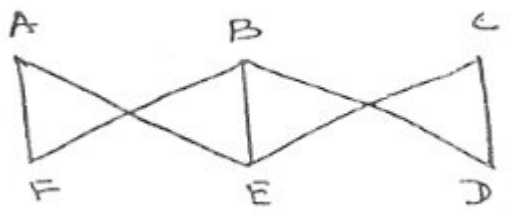
Examination: SE Semester III

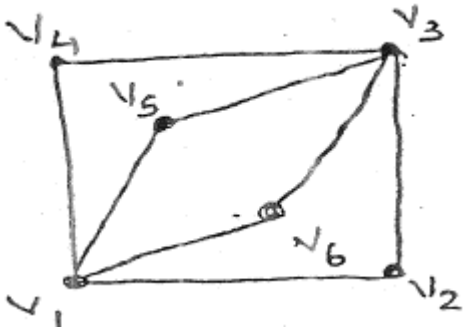
Course Code: CSC302 and Course Name: Discrete Structures and Graph Theory

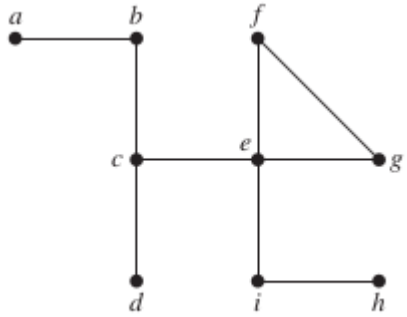
Time: 2 hour Max. Marks: 80

==========

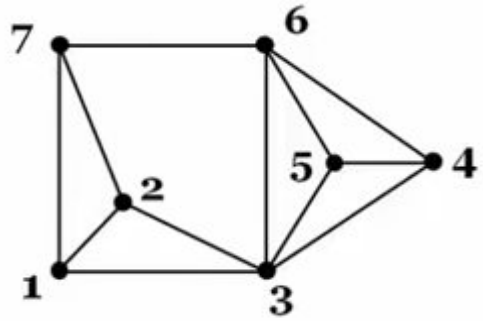
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Let A= {2,3,4,5,6} and let R1,R2 be relations on A such that R1={(a,b) | a-b=2 } and R2={(a,b)| a+1=b or a=2b} Find the composite relation R2.R1?
Option A:	{(4,3),(5,4),(6,2),(6,5)}
Option B:	{(3,2),(5,4),(4,3)}
Option C:	{(5,2),(6,3)}
Option D:	{(2,3),(3,4),(4,5),(5,6)}
2.	Which of the following is the correct representation of the sentence “Someone is liked by everyone “.
Option A:	(∃x)(∃y) likes(x,y)
Option B:	(∀x)(∀y) likes(x,y)
Option C:	(∃y)(∀x) likes(x,y)
Option D:	(∀x)(∃y) likes(x,y)
3.	Draw the Hasse diagram of D30. i) It is Complemented Lattice ii) It is Distributive Lattice Which of the above statement is True?
Option A:	Only i
Option B:	Only ii
Option C:	Both i and ii
Option D:	Neither i nor ii
4.	Consider the set N of positive integers, and let * denote the operation of least common multiple(lcm) on N. Which of the following sentence is True?
Option A:	(N,*) is not a Semi group.
Option B:	(N,*) is commutative Semi group
Option C:	(N,*) is not commutative Semi group.
Option D:	None of the Above.
5.	How many two digits or three digits numbers can be formed using the digits

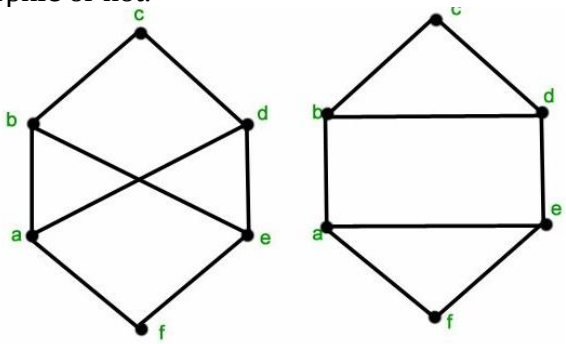
	1,2,3,4,5,6,7,8 and 9 , if no digits are repeated ?
Option A:	210
Option B:	24
Option C:	212
Option D:	252
6.	Consider the following subsets of the positive integers N. Which of the following is not closed under multiplication operation?
Option A:	A={0,1}
Option B:	E={1,3,5,….}
Option C:	C={x: x is prime}
Option D:	F={0,1,2}
7.	If every vertex of simple graph has same degree it is called as _____.
Option A:	Bipartite Graph
Option B:	Regular Graph
Option C:	Planner Graph
Option D:	Sub graph
8.	The less than relation,<, on real is
Option A:	A Partial ordering since it is asymmetric and reflexive.
Option B:	A partial ordering since it is anti-symmetric and reflexive.
Option C:	Not a partial ordering because it is not asymmetric and not reflexive.
Option D:	Not a partial ordering because it is not anti-symmetric and not reflexive.
9.	Consider set of integers from 1 to 250. Find how many of these numbers are divisible by 5 or 6 but not by 8?
Option A:	83
Option B:	69
Option C:	100
Option D:	31
10.	Consider G={1,5,7,11,17} under multiplication modulo 18. Find inverse of 5, 7and 17 ?
Option A:	11,17 and 13
Option B:	11,13 and 17
Option C:	11 , 17 and 7
Option D:	13,11 and 7
11.	The following graph is _____. 
Option A:	Bipartite Graph
Option B:	Complete Bipartite Graph
Option C:	Eulerian Graph
Option D:	Eulerian but not Bipartite Graph

12.	The set of integers Z with binary operation '*' defined as a*b=a+b+1 for a,b ∈Z , is a group. The identity element of this group is_____.
Option A:	0
Option B:	1
Option C:	-1
Option D:	12
13.	How many persons must be chosen in order that at least five of them will have birthdays in the same calendar month?
Option A:	28
Option B:	69
Option C:	49
Option D:	52
14.	 Which of the following is true for above graph? i) It is Eulerian Graph ii) It is Hamiltonian Graph
Option A:	Only i
Option B:	Only ii
Option C:	Both i and ii
Option D:	Neither i nor ii
15.	A Poset in which every pair of elements has both a least upper bound and a greatest lower bound is termed as _____
Option A:	Walk
Option B:	Trail
Option C:	Sub lattice
Option D:	Lattice
16.	State the type of function for following example " To each country assign the number of people living in the country"
Option A:	Many-One
Option B:	One-Many
Option C:	One-One
Option D:	Many-Many
17.	Let P: We should be trustworthy. Q: We should be committed. R: We should be overconfident. Then 'We should be trustworthy or committed but not overconfident.' is best represented by?

Option A**:**	P V Q ∧ R
Option B:	~P V ~Q V R
Option C:	P V Q ∧ ~R
Option D:	P ∧ ~Q ∧ R
18.	Total how many Cut Vertex exists in the following graph? 
Option A:	2
Option B:	4
Option C:	3
Option D:	1
19.	The binary relation {(a,a), (b,a), (b,b), (b,c), (b,d), (c,a), (c,b)} on the set {a,b,c} is _____
Option A:	irreflexive, symmetric and transitive
Option B:	reflexive, symmetric and transitive
Option C:	irreflexive and antisymmetric
Option D:	neither reflexive, nor irreflexive but transitive
20.	Which rule of inference is used in this argument? "No humans can fly. John is human. Therefore John can not fly."
Option A:	Universal instantiation
Option B:	Existential instantiation
Option C:	Universal generalization
Option D:	Existential generalization

Q2	
A	**Solve any Two** **5 marks each**
i.	Let A={1,2,3,4,5} , R={(a.b) | (a+b) is even}. R is a relation on set A. Check whether R s an equivalence relation?
ii.	X={2,3,6,1,24,36} R on X ={(x,y) ∈ R, x divides y} a) Construct Hasse diagram b) Maximum and Minimal elements? c) Give Chain and Ant chains. d) Maximum length of chain? e) Is a poset lattice?
iii.	Define the following with suitable example a)Ring b) Cyclic Group c) Monoid d)Normal Subgroup e) Planner Graph

B	**Solve any One** **10 marks each**
i.	Define with example Euler path, Euler circuit, Hamiltonian path and Hamiltonian circuit. Determine if following diagram has Euler path, Euler circuit, Hamiltonian path and Hamiltonian circuit and state the path/circuit. 
ii.	Find the number of code word generated by the parity check matrix H given below. Find all the code words generated. $H=\begin{vmatrix} 1\,1\,0\,1\,0\,0 \\ 0\,1\,1\,0\,1\,0 \\ 1\,0\,1\,0\,0\,1 \end{vmatrix}$

Q3.	
A	**Solve any Two** **5 marks each**
i.	Define Isomorphic Graph. Determine if following graphs G1 and G2 are isomorphic or not. 
ii.	Convert into CNF: ((P→Q)→R)
iii.	Functions f,g,h are defined on a set X={a,b,c} as f={(a,b),(b,c),(c,a)} g={(a,b),(b,a),(b.b)} h={(a,a),(b,b),(c,a)} i) Find fog, gof . Are they equal? ii) Find fogoh and fohog?
B	**Solve any One** **10 marks each**
i.	Prove that (z5,+5) is a Abelian group.
ii.	Solve the recurrence relation for Fibonacci sequence 1,1,2,3,5,8,13.

University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE, Panvel)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: COMPUTER ENGINEERING

Curriculum Scheme: Rev2019

Examination: SE Semester: III

Course Code: CSC303 and Course Name: DATA STRUCTURE

Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which data structure has fixed size?
Option A:	Array
Option B:	Linked List
Option C:	Graph
Option D:	Tree
2.	The result of evaluating the postfix expression 59+84-*8/
Option A:	6
Option B:	7
Option C:	5
Option D:	4

3.	What will be the output of the following program?
	
	void main ()
	{
	char str [] ="STRUCTURE";
	int len = strlen(str);
	int i;
	
	for (i=0; i<len; i++)
	push(str[i]); // pushes an element into stack
	
	for (i=0; i<len; i++
	pop (); //pops an element from the stack
	}

Option A:	ERUTCURTS
Option B:	CTURESTRU
Option C:	EUCRSTUTR
Option D:	STRUCTURE
4.	Which data structure is also known as a head tail linked list because elements can be added to or removed from the front (head) or back (tail)? However, no element can be added or deleted from the middle.
Option A:	Circular queue

Option B:	Stack
Option C:	Deque
Option D:	Priority queue
5.	A circular queue is implemented using an array of size 15. The array index starts with 0, front is 10, and rear is 14. The insertion of next element takes place at which array index?
Option A:	15
Option B:	1
Option C:	0
Option D:	11

6.	What will the output of the following function if nodes present in linked list are 6→5→2→8→9→NULL and START points the first node.
	
	void fun (struct node* START)
	{
	if (START == NULL)
	return;
	fun (START→next);
	printf ("%d “, START→data);
	}

Option A:	6,5,2,8,9
Option B:	9,8,2,5,6
Option C:	9,6,5,2,8
Option D:	9,8,2,6,5

7.	What is the output of following function if start pointing to first node of following linked list? 1→2→3→4→5→6→NULL
	
	void fun (struct node* start)
	{
	if (start == NULL)
	return;
	printf ("%d “, start→data);
	
	if (start→next! = NULL)
	fun(start→next);
	printf ("%d “, start→data);
	}

Option A:	6,5,4,3,2,1,6,5,4,3,2,1
Option B:	1,3,5,5,3,1,1,3,5,5,3,1
Option C:	1,3,5,2,4,6,1,3,5,2,4,6
Option D:	1,2,3,4,5,6,6,5,4,3,2,1
8.	Which type of linked list has no beginning and no ending.
Option A:	Circular Linked List
Option B:	Doubly Linked List
Option C:	Singly Linked List
Option D:	Multi Linked List

9.	In a doubly linked list, the number of pointers affected for an insertion operation in middle will be_____.
Option A:	1
Option B:	4
Option C:	0
Option D:	2
10.	struct node *ptr = start->next; what "ptr" will contain if it is variable of type struct node? (start points to first node)
Option A:	Address of second node
Option B:	Address field of second node
Option C:	Data of second node
Option D:	Data fields of second field
11.	What are the number of nodes in left and right sub-tree of the root node if the data is inserted in the following order in binary search tree 45, 15, 8, 56, 64, 65, 47, 12, 59, 10, 73, 50, 16, 61?
Option A:	6,7
Option B:	7,6
Option C:	8,5
Option D:	5,8

12.	Consider the following code segment in C to traverse a binary tree using the preorder
	
	void preorder (node *tree)
	{
	if (t)
	{
	Statement1
	Statement2
	Statement3
	}
	}
	The above Statements should be,

Option A:	printf("%d", tree->info);
	preorder(tree->right);
	preorder(tree->left);

Option B:	preorder(tree->left);
	preorder(tree->right);
	printf("%d", tree->info);

Option C:	preorder(tree->left);
	printf("%d", tree->info);
	preorder(tree->right);

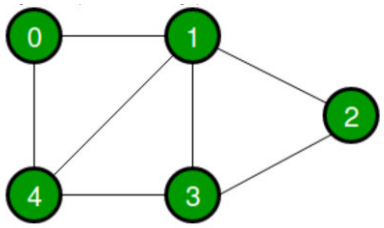
Option D:	printf ("%d", tree->info);
	preorder(tree->left);
	preorder(tree->right);

13.	A BST is traversed in the following order recursively: Right, root, left The output sequence will be in,
Option A:	Ascending order
Option B:	Descending order
Option C:	No specific sequence
Option D:	Random sequence
14.	What is the maximum possible number of nodes in a binary tree at level 6?
Option A:	64
Option B:	32
Option C:	48
Option D:	80

15.	Assume that a structure for a Binary Search Tree exists. What does the following function do?
	
	int function(root)
	{
	ptr = root;
	while (ptr->left!= NULL)
	{
	ptr = ptr->left;
	}
	return(ptr->data);
	}

Option A:	Leftmost child of BST
Option B:	Rightmost child of BST
Option C:	It gives error
Option D:	Root of BST
16.	When in-order and post-order traversing a tree resulted D, B, E, A, C, G, F and D, E, B, G, F, C, A respectively. the pre-order traversal would return:
Option A:	A, B, C, F, G, D, E
Option B:	A, D, E, B, C, F, G
Option C:	A, B, D, E, C, F, G
Option D:	A, B, G, F, D, E, C
17.	What is the number of edges present in a complete graph having n vertices?
Option A:	(n*(n+1))/2
Option B:	n
Option C:	(n-1)/2
Option D:	(n*(n-1))/2
18.	What is the maximum possible number of edges in a directed graph with no self-loops having 7 vertices?
Option A:	28
Option B:	35
Option C:	42
Option D:	56

19.	Using division method, in a given hash table of size 153, the key of value 172 be placed at position.
Option A:	19
Option B:	72
Option C:	17
Option D:	15
20.	What are the values of h1(k) and h2(k) in the double hashing?
Option A:	h1(k) = (m mod k) and h2(k) = 1+ (m' mod k)
Option B:	h1(k) = (1 + (m mod k)) and h2(k) = m' mod k
Option C:	h1(k) = (k mod m) and h2(k) = k mod m'
Option D:	h1(k) = (k mod m) and h2(k) = 1+ (k mod m')

Q2 **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	Write a C program to test if a string is a palindrome or not using a stack data structure (Note: palindromes ignore spacing, punctuation, and capitalization)
B	Write a C program that compresses a string by deleting all space characters in the string using queue data structure
C	Give the breadth-first traversal of the graph for following graph, starting from vertex 0. Show all the steps. 
D	Consider a hash table with size = 10. Using quadratic probing, insert the keys 27, 72, 63, 42, 36, 18, 29, 101 into the table. Take c1 = 1 and c2 = 3.
E	Explain types of data structure with example
F	Write an algorithm to convert infix expression to postfix expreesion. Show stepwise execution of algorithm for converting infix expression to postfix expression for following expression A * B + C * D

Q3. **(20 Marks Each)**	**Solve any Two Questions out of Three** **10 marks each**
A	Create an AVL tree using the following data entered as a sequential set. Show all the steps. *15, 20, 24, 10, 13, 7, 30, 36, 25.* Show which rotations are used while constructing AVL tree.
B	Write a C program for Singly Linked list for performing following operations i. Create SLL ii. Display SLL iii. Delete a node from SLL iv. Append two SLLs
C	Draw the B-tree of order 3 created by inserting the following data arriving in sequence: 92 24 6 7 11 8 22 4 5 16 19 20 78

University of Mumbai

Examination 2020 under cluster __(Lead College: _____)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

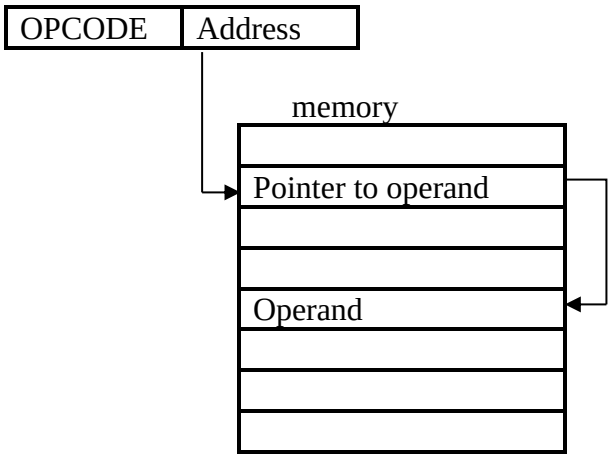
Examination: SE Semester III

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

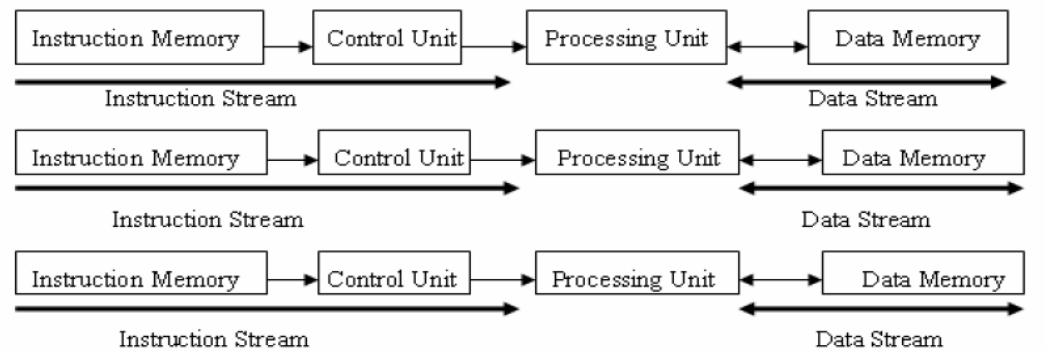
Time: 2 hour Max. Marks: 80

==========

Q1. 40 Marks	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks (2 marks each)**
1.	Convert number($723.17)_8$ into equivalent hexadecimal number
Option A:	(0D3.3C)16
Option B:	(1D3.3C)16
Option C:	(1E3.3C)16
Option D:	(1D3.4C)16
2.	What is the equivalent of $(52)_{10}$ in Gray code
Option A:	110100
Option B:	1011101
Option C:	111000
Option D:	101110
3.	As per Boolean Laws which of the expressions results in 0 (i) $A+\bar{A}$ (ii) $A.\bar{A}$ (iii)A.0 (iv) A. 1
Option A:	ii only
Option B:	ii &iii
Option C:	iii only
Option D:	ii,iii,iv
4.	For 4 bit number what is the range of 2's complement representation? Also perform $(5)_{10}$-$(7)_{10}$ using 2's complement method
Option A:	-7 to +7 , 1101
Option B:	-8 to +8 , 1110
Option C:	-8 to +7 , 1110
Option D:	-7 to +8 , 1101
5.	Arrange the steps for obtaining IEEE representation of floating point in proper

	format 1) calculate the biased exponent 2) convert to binary 3) convert to normalized form
Option A:	1,2,3
Option B:	3,2,1
Option C:	2,3,1
Option D:	2,1,3
6.	In Restoring division Algorithm if A<0 then which of the following is immediate step (Assume M as Dividend Q as Divisor and A as result)
Option A:	Q_0 =0
Option B:	A= A +M
Option C:	Q_0 =0 & A=A-M
Option D:	Q_0 =0 & A=A+M
7.	In full adder, Boolean expression of sum will be_____
Option A:	S=A XOR $\overline{B}$
Option B:	S=$\overline{A}$ XOR B
Option C:	S = A XOR B XOR C
Option D:	S = A XOR B XOR $\overline{C}$
8.	Which of the following Twos Complement binary numbers is equivalent to decimal −75 ?
Option A:	1001011
Option B:	1001100
Option C:	0001100
Option D:	0110101
9.	Identify the type of addressing mode Instruction 
Option A:	Register Addressing mode
Option B:	Register Indirect Addressing mode
Option C:	Direct Addressing mode
Option D:	Indirect Addressing mode

10.	Choose appropriate sequence of instruction cycle
Option A:	Instruction fetch, Instruction address calculation, Instruction decode, operand address calculation , fetch operand, data operation, operand address calculation, operand store
Option B:	Instruction address calculation , Instruction fetch, operand address calculation fetch operand, Instruction decode, data operation, operand address calculation and operand store
Option C:	Instruction address calculation , Instruction fetch, Instruction decode, operand address calculation , fetch operand, data operation , operand address calculation, operand store
Option D:	Instruction address calculation, Instruction fetch, Instruction decode, operand address calculation , fetch operand, operand address calculation , operand store, data operation
11.	Basic task for control unit is
Option A:	To perform logical operations
Option B:	Execution
Option C:	To initiate the resources
Option D:	To decode instructions and generate control signal
12.	A micro instruction has ____
Option A:	Control field
Option B:	Address field
Option C:	Status field
Option D:	Both control and address field
13.	Microprogram consisting of _____ is stored in control memory of control unit
Option A:	instructions
Option B:	micro instructions
Option C:	micro program
Option D:	macro program
14.	In memory Hierarchy which is the fastest memory
Option A:	SRAM
Option B:	DRAM
Option C:	Register
Option D:	Cache
15.	The correspondence between the main memory blocks and those in the cache is given by _____.
Option A:	Mapping function
Option B:	Hash function
Option C:	Locale function
Option D:	Assign function
16.	Consider a direct mapped cache of size 64 KB with block size 16 bytes. The CPU generates 28-bit addresses. The number of bits needed for cache indexing are

	respectively are:
Option A:	13
Option B:	10
Option C:	12
Option D:	11
17.	In Instruction Pipelining Structural Hazard means
Option A:	any condition in which either the source or the destination operands of an instruction are not available at the time expected in the pipeline
Option B:	a delay in the availability of an instruction causes the pipeline to stall
Option C:	the situation when two instructions require the use of a given hardware resource at the same time.
Option D:	When a data gets overwritten by branching
18.	Identify the Type of Flynn's Classification of Parallel Processing 
Option A:	SISD
Option B:	SIMD
Option C:	MISD
Option D:	MIMD
19.	To resolve the clash over the access of the System Bus we use
Option A:	BUS arbitrator
Option B:	Multiple BUS
Option C:	Priority access
Option D:	virtual access
20.	SIMD represents an organization that _____.
Option A:	refers to a computer system capable of processing several programs at the same time.
Option B:	represents organization of single computer containing a control unit, processor unit and a memory unit.
Option C:	includes many processing units under the supervision of a common control unit
Option D:	includes many processing units with many control unit.

Q2 **20 Marks**	**Solve any Four out of Six (5 marks each)**
A	Show the mathematical step for the following conversion

	i) Convert decimal (123.25) to its equivalent octal ii) Convert decimal (123.25) to its equivalent hexadecimal iii) Convert Hexadecimal (ABCD) to its equivalent binary iv) Convert binary (10111100) to equivalent gray code v) Convert decimal (1543) to Excess-3 code
B	Write short note on Von-Neumann Model
C	Explain the single and double precision format for representing floating point number using IEEE 754 standards
D	Define Instruction cycle. Explain it with a detailed state diagram.
E	Differentiate between static RAM and dynamic RAM.
F	What are the functions of following Register 1. IR 2. PC 3. MAR 4. MDR 5. SP

Q3. **20 marks**	
A	**Solve any Two Questions out of Three (5 marks each)**
i)	Write micro program for the instruction ADD A, B (Register A and B are added and result is stored at Register A.)
ii)	Differentiate between Hardwired control unit and Micro programmed control unit
iii)	Explain memory Hierarchy
B	**Solve any One Question out of two (10 marks each)**
i)	A program having 10 instructions (without Branch and Call instructions) is executed on non-pipeline and pipeline processors. All instructions are of same length and having 4 pipeline stages and time required to each stage is 1nsec. (Assume the four stages as Fetch Instruction ,Decode Instruction, Execute Instruction, Write Output) i. Calculate time required to execute the program on Non-pipeline and Pipeline processor. Ii Show the pipeline processor with a diagram.
ii)	Draw the flowchart of Restoring Division Algorithm & perform 10 /3 using this Algorithm

University of Mumbai

Examination 2020 under cluster __ (Lead College: _____)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: CSC305 and Course Name: Computer Graphics

Time: 2 hour Max. Marks: 80

==========

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	In mid point ellipse method, coordinate of points lying on ellipse are calculated in
Option A:	One quadrant first and others by successive rotation
Option B:	One quadrant first and others by successive reflection
Option C:	One quadrant first and others by successive translation
Option D:	All quadrants
2.	In DDA line drawing method, for lines having negative slope with absolute value greater than 1 and taking right end point as starting point, the X and Y coordinate increments are
Option A:	1/m and -1
Option B:	-1/m and 1
Option C:	-1 and –m
Option D:	1 and m
3.	In Homogenous Coordinate System, all Transformations are captured by
Option A:	Addition
Option B:	Subtraction
Option C:	Multiplication
Option D:	Division
4.	In Liang Barsky line clipping method, for a parallel lines, k indicates window boundary if
Option A:	$P_k > 0$
Option B:	$P_k < 0$
Option C:	$P_k = 0$
Option D:	$P_k \neq 0$
5.	What is the 1st point on the circumference of the circle centered at (10,10) with radius = 10, using midpoint circle method
Option A:	(0, 10)
Option B:	(1,10)
Option C:	(1,9)
Option D:	(10,20)
6.	Coordinates of clipping window are (4,4) and (9,8). A line is drawn from point A(2,2) to point B(12,9). The result of logical AND operation on the region codes

	is
Option A:	0101
Option B:	1010
Option C:	1111
Option D:	0000
7.	A circle is drawn at (30,30) with radius = 10. Its mirror image cannot be obtained by
Option A:	Rotation by 90^0.
Option B:	Reflection about Y-axis
Option C:	Translation by $T_x = 60$ and $T_y = 0$
Option D:	Scaling by $S_x = -1$ and $S_y = 1$
8.	A conceptual line is drawn starting from the particular point and extending to a distance point outside the coordinate extends of the object in direction of X-axis, the line intersects twice with the polygon edges and once with the polygon vertex. Then according to inside outside test, the point lies
Option A:	Outside the polygon
Option B:	Inside the polygon
Option C:	On the boundary of the polygon
Option D:	Cannot say
9.	To clip concave area, which of the following algorithm is best suited
Option A:	Cohen Sutherland line clipping method
Option B:	Liang barsky line clipping method
Option C:	Sutherland Hodgeman polygon clipping method
Option D:	Weiler Atherton polygon clipping method
10.	In depth buffer method, when z > depth of (x,y)
Option A:	Point is visible
Option B:	Z value is not stored in depth buffer
Option C:	Z value is stored as surface intensity value
Option D:	Z value is stored in depth buffer
11.	Give the series of transformation required to rotate an object about any arbitrary axis not parallel to any one of the coordinate axes in 3D space
Option A:	$R = [T] [R_x][R_y] [R_z] [R_y^{-1}] [R_x^{-1}] [T^{-1}]$
Option B:	$R = [T] [R_y][R_z] [R_x] [R_x^{-1}] [R_y^{-1}] [T^{-1}]$
Option C:	$R = [T] [R_y][R_z] [R_x] [R_y^{-1}] [R_z^{-1}] [T^{-1}]$
Option D:	$R = [R_x][R_y][R_z][T] [R_x^{-1}] [R_y^{-1}] [R_z^{-1}]$
12.	In window to viewport mapping, which of the following set of transformations are involved
Option A:	Translation and scaling
Option B:	Scaling and rotation
Option C:	Scaling and reflection
Option D:	Rotation and translation
13.	What happens when in 3D space uniform scaling with respect to origin is performed, I) Original shape of object may change

	II) Original position of object may change
Option A:	Only I
Option B:	Only II
Option C:	Both I and II
Option D:	Neither I nor II
14.	Which of the following input is accepted only by Boundary Fill method and not by Flood fill method
Option A:	Fill color
Option B:	Background color
Option C:	Edge color
Option D:	Seed pixel
15.	To convert a square into a parallelogram, which transformation is used
Option A:	Scaling
Option B:	Shear
Option C:	Scaling followed by rotation
Option D:	Rotation
16.	Which of the following is not a property of Bezier curve
Option A:	Bezier curves are multivalued.
Option B:	A Bezier curve is independent of the coordinate system used to measure the location of control points.
Option C:	Bezier curves provide global control.
Option D:	Bezier curves are not variation diminishing
17.	Which of the following statement does not define computer graphics
Option A:	The technology that deals with designs and pictures on computers.
Option B:	Visual images or designs on some surface such as wall, paper to inform, illustrate or entertain.
Option C:	Almost everything on computer that is not text or sound.
Option D:	It is an art of drawing pictures on a computer screen with the help of programming.
18.	First reflect a point about x-axis, then perform a counter clock wise rotation of 90^0, this is equivalent to ___
Option A:	Reflection about a line X=Y
Option B:	Reflection about a line X=-Y
Option C:	Rotation about a line X=Y
Option D:	Rotation about a line X=-Y
19.	What is the length of Koch curve after second Approximation
Option A:	16/9
Option B:	24/9
Option C:	8/6
Option D:	64/27
20.	Let N be the normal vector of the plane surface with N=(A,B,C). For a plane to be a back face
Option A:	C <= 0

Option B:	C >= 0
Option C:	C < 0
Option D:	C > 0

Q.2 A	**Solve any Two** **5 marks each**
i.	What is computer graphics? Discuss application areas in computer graphics
ii.	Write a boundary fill procedure to fill a polygon using 8-connected approach.
iii.	Derive the composite matrix to scale an object with respect to a fixed point
Q.2 B	**Solve any One** **10 marks each**
i.	Given radius r = 12 and center coordinates (50,50), compute the coordinates of points lying on the circle using Mid point circle algorithm
ii.	Derive transformation matrix for perspective projection.

Q.3 A	**Solve any Two** **5 marks each**
i.	What is aliasing and explain any one antialiasing technique.
ii.	Prove that 2D rotations are additive
iii.	Define the following terms with suitable example/diagram a. Variation diminishing property b. Order of continuity
Q.3 B	**Solve any One** **10 marks each**
i.	Define window, viewport and derive the equations for window to viewport transformation
ii.	What is keyframing and explain character and facial animation