University of Mumbai

Examination 2020 under cluster ___ (Lead College Shortname)

Program: Computer Engineering& IT

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC301and Course Name: Applied Mathematic-III

Time: 1 hour Max. Marks: 50

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	A
Q2.	C
Q3.	A
Q4	B
Q5	C
Q6	C
Q7	A
Q8.	B
Q9.	A
Q10.	A
Q11.	D
Q12.	C
Q13.	B
Q14.	A
Q15.	A
Q16.	C
Q17.	D
Q18.	B
Q19.	C
Q20.	A
Q21.	D
Q22.	D
Q23.	A
Q24.	B
Q25.	C

University of Mumbai

Examination 2020 under cluster ___ (Lead College Short name)

Program: Computer Engineering

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC 301(CBSGS) and Course Name: Applied Mathematics-III

Time: 1 hour Max. Marks: 50

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All the Questions are compulsory and carry equal marks.

Q1.	What is the Laplace Transformation of $c^{at}, (c > 0, s > alogc)$ i.e. $L(c^{at})$
Option A:	$L(c^{at}) = \frac{1}{s - alogc}$
Option B:	$L(c^{at}) = \frac{1}{s + alogc}$
Option C:	$L(c^{at}) = \frac{1}{s - alogct}$
Option D:	$L(c^{at}) = \frac{1}{st + alogc}$
Q2.	What is the Laplace Transformation of $L(t^n)$where n is a +ve integer
Option A:	$L(t^n) = \frac{(n+1)!}{s^{n+1}}$
Option B:	$L(t^n) = \frac{n!}{s^n}$
Option C:	$L(t^n) = \frac{n!}{s^{n+1}}$
Option D:	$(t^n) = \frac{n!}{s^{n-1}}$
Q3.	$L(te^{-t}\, cos\, h\, 2t)$
Option A:	$\frac{1}{2}\left[\frac{1}{(s-1)^2} + \frac{1}{(s+3)^2}\right]$
Option B:	$\frac{1}{2}\left[\frac{1}{(s+1)^2} + \frac{1}{(s+3)^2}\right]$
Option C:	$\frac{1}{2}\left[\frac{1}{(s-1)^2} - \frac{1}{(s+3)^2}\right]$
Option D:	$\frac{1}{2}\left[\frac{2}{(s-1)^2} + \frac{1}{(s+3)^2}\right]$
Q4.	Evaluate $\int_0^\infty \frac{cos\, 6t - cos\, 4t}{t} \cdot dt$
Option A:	$log\frac{4}{3}$
Option B:	$log\frac{2}{3}$
Option C:	$log\frac{8}{3}$

Option D:	$log\frac{6}{3}$
Q5.	Find the inverse Laplace transforms by using convolution theorem $\frac{s^2}{(s^2+a^2)^2}$
Option A:	$\frac{1}{2a}[sin\ at - at\ cos\ at]$
Option B:	$\frac{1}{a}[sin\ at + at\ cos\ at]$
Option C:	$\frac{1}{2a}[sin\ at + at\ cos\ at]$
Option D:	$\frac{1}{2a}[sin\ at + cos\ at]$
Q6.	What is the Parseval's Identity in $(c, c+2l)$ of Fourier Series
Option A:	$\frac{1}{2l}\int_c^{c+2l}[f(x)]dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$
Option B:	$\frac{1}{2l}\int_c^{c+2l}[f(x)]^2dx = a_0 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$
Option C:	$\frac{1}{2l}\int_c^{c+2l}[f(x)]^2dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}({a_n}^2 + {b_n}^2)$
Option D:	$\frac{1}{2l}\int_c^{c+2l}[f(x)]^2dx = {a_0}^2 + \frac{1}{2}\sum_{n=1}^{\infty}(a_n + b_n)$
Q7.	What is the Parseval's Identity in $(0, l)$ of half range Cosine series
Option A:	$\frac{1}{l}\int_0^l[f(x)]^2dx = {a_0}^2 + \frac{1}{2}({a_1}^2 + {a_2}^2 + {a_3}^2 + \cdots\infty)$
Option B:	$\frac{1}{l}\int_0^l[f(x)]^2dx = {a_0}^2 + ({a_1}^2 + {a_2}^2 + {a_3}^2 + \cdots\infty)$
Option C:	$\frac{1}{2l}\int_0^l[f(x)]^2dx = {a_0}^2 + ({a_1}^2 + {a_2}^2 + {a_3}^2 + \cdots\infty)$
Option D:	$\int_0^l[f(x)]^2dx = {a_0}^2 + \frac{1}{2}({a_1}^2 + {a_2}^2 + {a_3}^2 + \cdots\infty)$

Q8.	Obtain the Fourier expansion of $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in the interval $0 \leq x \leq 2\pi$ and $f(x + 2\pi) = f(x)$ then what is a_n
Option A:	$\frac{1}{n}$
Option B:	$\frac{1}{n^2}$
Option C:	$\frac{1}{n^3}$
Option D:	$\frac{2}{n^2}$
Q9.	Obtain the cosine series of $f(x) = sinx$ in the interval $0 \leq x \leq \pi$ and $f(x + 2\pi) = f(x)$.
Option A:	$\frac{2}{\pi} - \frac{4}{\pi}\left(\frac{cos2x}{3} + \frac{cos4x}{15} + \frac{cos6x}{35} + \cdots\right)$
Option B:	$\frac{2}{\pi} - \frac{4}{\pi}\left(\frac{cos2x}{2} + \frac{cos4x}{4} + \frac{cos6x}{6} + \cdots\right)$
Option C:	$\frac{2}{\pi} - \frac{4}{\pi}\left(\frac{cos2x}{4} + \frac{cos4x}{16} + \frac{cos6x}{36} + \cdots\right)$
Option D:	$\frac{2}{\pi} - \frac{4}{\pi}\left(\frac{cos2x}{1} + \frac{cos4x}{3} + \frac{cos6x}{5} + \cdots\right)$
Q10.	If $f(z)$ is analytic and $\lvert f(z) \rvert$ is constant then $f(z)$is
Option A:	Constant
Option B:	z
Option C:	z^3
Option D:	z^2
Q11.	C-R equation in Cartesian coordinates system
Option A:	$u_x = v_y, u_y = v_x$
Option B:	$u_x = -v_y, u_y = -v_x$
Option C:	$u_x = -v_y, u_y = v_x$
Option D:	$u_x = v_y, u_y = -v_x$

Q12.	Find the value of k if $f(z) = r^{10}\ cos\ k\theta + ir^{2k}\ sin\ k\theta$
Option A:	10
Option B:	20
Option C:	5
Option D:	2
Q13.	Find the bilinear transformation which maps the points Z=1,i,-1 onto the points W=i,0,-i.
Option A:	$W = \frac{i+z}{i+z}$
Option B:	$W = \frac{i-z}{i+z}$
Option C:	$W = \frac{i+z}{i-z}$
Option D:	$W = \frac{i-z}{i-z}$
Q14.	If $f(z)$ is analytic and $u + v = \frac{2sin\ 2x}{e^{2y}+e^{-2y}-2cos\ 2x}$, find $f(z)$
Option A:	$\frac{(1+i)cos\ z}{2\ sin\ z} + c$
Option B:	$\frac{(1-i)cos\ z}{2\ sin\ z} + c$
Option C:	$\frac{(1+i)cos\ z}{sin\ z} + c$
Option D:	$\frac{(-1+i)cos\ 2z}{2\ sin\ z} + c$
Q15.	If $u = \frac{1}{2} log\ (x^2 + y^2)$ then find its corresponding analytic function
Option A:	$log\ z + c$
Option B:	$log\ z - c$
Option C:	$v = \tan^{-1}\frac{y}{x} + c$
Option D:	$v = \tan^{-1}\frac{x}{y} + c$
Q16.	Find the total work done in moving a particle in the force field

	$\bar{F}$ = 3xy i – 5z j + 10xk along x = t^2 + 1, y = $2t^2$, z = t^3 from t=1 and t=2
Option A:	301
Option B:	302
Option C:	303
Option D:	304
Q17.	If $\bar{F} = (y^2\cos x + z^3)i + (2y\sin x - 4)j + (3xz^2 + 2)k$ is a conservative field.Find The scalar potential for $\bar{F}$.
Option A:	$y^2\sin x + z^3 - 4y - 2z$
Option B:	$y^2\sin x + z^3x - 4y - 4z$
Option C:	$y^2\cos x + z^3x - 4y - 4z$
Option D:	$y^2\sin x + z^3x - 4y - 2z$
Q18.	Determine a, b, c if $\bar{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is irrotational.
Option A:	$a = -4, b = 2, c = -1$
Option B:	$a = 4, b = 2, c = -1$
Option C:	$a = 4, b = -2, c = -1$
Option D:	$a = 4, b = 2, c = 1$
Q19.	In vector $\bar{F} = \frac{\bar{r}}{r^3}, then\ \bar{F}$
Option A:	Irrotational
Option B:	$Solenoidal$
Option C:	Both(a) and (b)
Option D:	None of the Above
Q20.	Using Gauss Divergence Theorem, to evaluate $\iint_S \bar{N}.\ \bar{F}$ ds, where $\bar{F}$= 2xi + xyj + zk over the region bounded by cylinder $x^2 + y^2 = 4$, z = 0, z = 6
Option A:	72π
Option B:	144π
Option C:	84π
Option D:	36π
Q21.	$Find\ the\ Z - Transform\ of\ f(k) = C^k\ k < 0$

Option A:	$\frac{1}{C-z}$
Option B:	$\frac{z}{z-C}$
Option C:	$\frac{z}{C+z}$
Option D:	$\frac{z}{C-z}$
Q22.	$What\ is\ the\ ROC\ of\ f(k)=\frac{a^k}{k!}, k \geq 0$
Option A:	$I\ z\ I < K$
Option B:	$I\ z\ I \leq K$
Option C:	$I\ z\ I \geq K$
Option D:	$All\ \ z-Plane$
Q23.	$find\ Z[coshak], k \geq 0$
Option A:	$\frac{z(z-cosha)}{z^2-2z\ cosha+1}$
Option B:	$\frac{z(1-cosha)}{z^2-2z\ cosha+1}$
Option C:	$\frac{z(z+cosha)}{z^2-2z\ cosha+1}$
Option D:	$\frac{z(z-cosha)}{z^2-2z\ cosha-1}$
Q24.	$if\ Z[f(k)]=F(z), then\ Z[e^{-ak}f(k)]$
Option A:	$F(e^{-a}z)$
Option B:	$F(e^{a}z)$
Option C:	$F(e^{-ak}z)$
Option D:	$F(e^{-k}z)$

Q25.	$find\ the\ inverse\ \ Z-transform\ of\ F(Z)=\frac{1}{(z-3)(z-2)}\ if\ ROC\ is\ IzI<2$
Option A:	$Z^{-1}[F(z)]=\{2^{k-1}-3^{k-1}\}, K\geq 0$
Option B:	$Z^{-1}[F(z)]=\{2^{k-1}-3^{k-1}\}, K> 0$
Option C:	$Z^{-1}[F(z)]=\{2^{k-1}-3^{k-1}\}, K\leq 0$
Option D:	$Z^{-1}[F(z)]=\{2^{k-1}-3^{k-1}\}, K< 0$

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC302 and Course Name: Object Oriented Programming Methodology

Time: 1 hour Max. Marks: 50

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	A
Q3.	C
Q4	A
Q5	D
Q6	B
Q7	C
Q8.	A
Q9.	D
Q10.	C
Q11.	D
Q12.	C
Q13.	C
Q14.	C
Q15.	D
Q16.	A
Q17.	B
Q18.	D
Q19.	D
Q20.	C
Q21.	C
Q22.	B
Q23.	C
Q24.	A
Q25.	C

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC302 and Course Name: Object Oriented Programming Methodology

Time: 1 hour Max. Marks: 50

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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	The process of hiding the implementation details and showing only functionality to the user
Option A:	Polymorphism
Option B:	Inheritance.
Option C:	Duplication.
Option D:	Abstraction.

Q2.	public class B1Demo {
	private static int i = 0;
	private static int j = 0;
	public static void main(String[] args) {
	int i = 9;
	int k = 5;
	{
	int j = 3;
	System.out.println("i + j is "+i +j);
	}
	k = i + j;
	System.out.println(k);
	System.out.println(j);
	}
	}

Option A:	i + j is 93 9 0
Option B:	i + j is 14 9 3
Option C:	i + j is 12 9 3
Option D:	i + j is 9 3 5
Q3.	Which of the following is TRUE about the break statement in Java in the context of loop?
Option A:	Break forces the control out of the loop and starts the execution of next iteration.

Option B:	Break halts the execution of the loop for certain time frame.
Option C:	Break forces the control out of the loop.
Option D:	Break stops the execution of entire program.
Q4.	In Java, which of the following data type groups are of same size?
Option A:	int and float
Option B:	int and long
Option C:	long and float
Option D:	float and double
Q5.	Java is a platform independent programming language because
Option A:	It follows the concept of write once and compile everywhere.
Option B:	Java compiler translates the source code directly to the machine level language.
Option C:	It is written in an almost similar manner as English language.
Option D:	It compiles to an intermediate code targeting a virtual machine, which can be interpreted by an interpreter for a given OS.
Q6.	What is the significance of the '*' in the following line, where "package" denotes a name of a package? import package.*;
Option A:	Only the classes of this package will be imported.
Option B:	All the classes and interfaces of this package will be imported.
Option C:	Only the interfaces of this package will be imported.
Option D:	All the classes, interfaces and sub-packages of this package will be imported.
Q7.	Which of the following access specifier (s) should you choose if you need access restricted to only subclass in the same package or different package?
Option A:	default
Option B:	private protected
Option C:	protected
Option D:	private

Q8.	public class B1{
	public static void main(String[] args) {
	try {
	int a=100;
	System.out.println(a);
	int b=a/0;
	a=a+1;
	System.out.println(a);
	}
	catch(ArithmeticException e) {
	System.out.println("Exception thrown: cannot divide by zero");
	}
	}
	}

Option A:	100 Exception thrown: cannot divide by zero

Option B:	101 Exception thrown: cannot divide by zero
Option C:	100 101
Option D:	101 100
Q9.	Which of the following block is always executed, independently of a exception being raised?
Option A:	Throw
Option B:	Throws
Option C:	Catch
Option D:	Finally
Q10.	Which of the following is NOT a method of the Thread class in Java?
Option A:	isAlive()
Option B:	getPriority()
Option C:	getNames()
Option D:	sleep()
Q11.	Which of the following method can be used to know the priority of a thread?
Option A:	priority()
Option B:	isRunning()
Option C:	getThreadPriority()
Option D:	getPriority()
Q12.	Suppose you want to display the text OBJECT ORIENTAED PROGRAMMING METHODOLOGY in an applet. Which of the following method can be used for the same?
Option A:	display()
Option B:	print()
Option C:	drawString()
Option D:	transient()
Q13.	Which of these methods of class String is used to extract a substring from a String object?
Option A:	Substring()
Option B:	subString ()
Option C:	substring()
Option D:	SubString()
Q14.	Why array is called Homogeneous collection of data?
Option A:	An array can store different types of data
Option B:	Size of an array is limited
Option C:	An array can store only one type of data
Option D:	An array uses indices for addressing an item stored in it
Q15.	Which of these methods is used to add elements in vector at specific location?

Option A:	addItem()
Option B:	setItem()
Option C:	AddElement()
Option D:	addElement()
Q16.	Which one of the following belongs to the part of the Java system that is responsible for executing Java programs?
Option A:	Java Virtual Machine
Option B:	Java Developer Connection
Option C:	Java Naming and Directory Interface
Option D:	Java Development Kit
Q17.	Which feature of Object-Oriented Programming(OOP) indicates code reusability?
Option A:	Encapsulation
Option B:	Inheritance
Option C:	Abstraction
Option D:	Polymorphism
Q18.	If different properties and functions of a real world entity is grouped or embedded into a single element, what is it called in Object-Oriented Programming language?
Option A:	Inheritance
Option B:	Polymorphism
Option C:	Abstraction
Option D:	Encapsulation
Q19.	If there is an abstract method in a class, then which of the following is NOT true.
Option A:	The class should be declared abstract.
Option B:	No object of the class can be created.
Option C:	Any subclass of the class may or may not be abstract class.
Option D:	A final class can have abstract method(s) and an abstract class can be declared final.
Q20.	Suppose P and Q are two interfaces. Assuming that class R wants to implement both interfaces. Then which of the following statements is true?
Option A:	class R extends P, Q { ... }
Option B:	class R extends P implements Q { ... }
Option C:	class R implements P, Q { ... }
Option D:	class R implements P extends Q { ... }
Q21.	A _____is a special member function whose task is to initialize the object of its class.
Option A:	Selector
Option B:	Destructor
Option C:	Constructor
Option D:	Iterator
Q22	Which of the following Object Oriented concept is implemented through method

	overloading?
Option A:	Inheritance
Option B:	Polymorphism
Option C:	Encapsulation
Option D:	Abstraction
Q23.	Which is the default access modifier when we do not mention any access modifier explicitly?
Option A:	private
Option B:	protected
Option C:	default
Option D:	public
Q24.	Which of the following is a valid declaration of an object of class Product?
Option A:	Product obj = new Product ();
Option B:	Product obj = new Product;
Option C:	obj() = new Product ();
Option D:	new Product obj;

Q25.	class area
	{
	int width;
	int length;
	int area;
	void area(int width, int length)
	{
	this.width = width;
	this.length = length;
	}
	
	}
	class Output
	{
	public static void main(String args[])
	{
	area obj = new area();
	obj.area(7 , 8);
	System.out.println(obj.length + " "+" " + obj.width);
	}
	}

Option A:	8 8
Option B:	7 8
Option C:	8 7
Option D:	7 1

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC303 and Course Name: Data Structures

Time: 1 hour Max. Marks: 50

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	A
Q3.	C
Q4	B
Q5	C
Q6	B
Q7	A
Q8.	C
Q9.	A
Q10.	B
Q11.	A
Q12.	D
Q13.	D
Q14.	C
Q15.	A
Q16.	A
Q17.	C
Q18.	B
Q19.	D
Q20.	B
Q21.	C
Q22.	B
Q23.	B
Q24.	A
Q25.	C

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC303 and Course Name: Data Structures

Time: 1 hour Max. Marks: 50

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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	ADT means
Option A:	Absolute Data Type
Option B:	Abstract Data Tree
Option C:	Abstract Discrete Tree
Option D:	Abstract Data Type
Q2.	Which of the following data structure can't store the non-homogeneous data elements?
Option A:	Arrays
Option B:	Records
Option C:	Pointers
Option D:	Stacks
Q3.	Which of the following is a linear data structure?
Option A:	Graphs
Option B:	Maps
Option C:	Stack
Option D:	Trees
Q4.	Inserting an item into the stack when stack is not full is called _____. Operation and deletion of item form the stack, when stack is not empty is called _____ operation.
Option A:	pop, push
Option B:	push, pop
Option C:	insert, delete
Option D:	delete, insert
Q5.	A variant of linked list in which last node of the list points to the first node of the list is?
Option A:	Singly linked list
Option B:	Doubly linked list
Option C:	Circular linked list
Option D:	Multiple linked list
Q6.	Which data structure is used in breadth first search of a graph to hold nodes?
Option A:	Stack
Option B:	Queues
Option C:	Tree

Option D:	Array
Q7.	The situation when in a linked list START=NULL is ____.
Option A:	Underflow
Option B:	Overflow
Option C:	Houseful
Option D:	Saturated
Q8.	Each node in a linked list must contain at least ____.
Option A:	Three fields
Option B:	Four fields
Option C:	Two fields
Option D:	One field
Q9.	A linear list in which the pointer points only to the successive node is ……
Option A:	Singly linked list
Option B:	Doubly linked list
Option C:	Circular linked list
Option D:	Doubly circular linked list
Q10.	The following postfix expression with single digit operands is evaluated using a stack: 8 2 3 ^ / 2 3 * + 5 1 * -
Option A:	1, 5
Option B:	6, 1
Option C:	5, 7
Option D:	3, 2
Q11.	Breadth First Search is
Option A:	Scanned all incident edges before moving to other vertex.
Option B:	Scanned all unvisited vertices as soon as possible.
Option C:	Same as backtracking.
Option D:	Computes a path between two vertices of graph or equivalently.
Q12.	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
Q13.	Which of the following is false about a binary search tree?
Option A:	The left child is always lesser than its parent
Option B:	The right child is always greater than its parent
Option C:	The left and right sub-trees should also be binary search trees
Option D:	In order sequence gives decreasing order of elements
Q14.	If the elements “A”, “B”, “C” and “D” are placed in a queue and are deleted one at a time, in what order will they be removed?
Option A:	D C B A

Option B:	D C A B
Option C:	A B C D
Option D:	A D B C
Q15.	What is an AVL tree?
Option A:	A tree which is balanced and is a height balanced tree.
Option B:	A tree which is unbalanced and is a height balanced tree.
Option C:	A tree with three children.
Option D:	a tree with at most 3 children.
Q16.	In Queues, we can insert an element at ___ end and can delete an element at ____ end.
Option A:	REAR, FRONT
Option B:	FRONT, REAR
Option C:	TOP, BOTTOM
Option D:	BOTTOM, TOP
Q17.	In Huffman coding, data in a tree always occur at ?
Option A:	Root
Option B:	Left sub tree
Option C:	Leaves
Option D:	Right sub tree
Q18.	A circular queue is implemented using an array of size 10. The array index starts with 0, front is 6, and rear is 9. The insertion of next element takes place at the array index____.
Option A:	7
Option B:	0
Option C:	9
Option D:	10
Q19.	Which of the following is not an exchange sort?
Option A:	Bubble Sort
Option B:	Quick Sort
Option C:	Partition-exchange Sort
Option D:	Insertion Sort
Q20.	For finding a node in a _____, at each stage we ideally reduce the number of nodes we have to check by half.
Option A:	Binary Tree
Option B:	Binary Search Tree
Option C:	AVL Tree
Option D:	Binary Heap Tree
Q21.	The average number of key comparisons required for a successful search for sequential search on items is ____.
Option A:	n/2
Option B:	(n-1)/2

Option C:	(n+1)/2
Option D:	n
Q22.	What is a hash table?
Option A:	A structure that maps values to keys.
Option B:	A structure that maps keys to values.
Option C:	A structure used for storage.
Option D:	A structure used to implement stack and queue.
Q23.	Binary Trees with threads are called as _____.
Option A:	Pointer Trees.
Option B:	Threaded Binary Trees.
Option C:	Special Trees.
Option D:	Huffman Trees.
Q24.	What is the average case time complexity of Merge sort ?
Option A:	O(n log n)
Option B:	O(n2)
Option C:	O(n2 log n)
Option D:	O(n log n2)
Q25.	Which is the safest method to choose a pivot element?
Option A:	choosing the first element as pivot.
Option B:	choosing the last element as pivot.
Option C:	choosing a random element as pivot.
Option D:	median-of-three partitioning method.

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: **CSC304** and Course Name**: Digital Logic Design and Analysis**

Time: 1 hour Max. Marks: 50

==========

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	**D**
Q2.	**A**
Q3.	**B**
Q4	**A**
Q5	**B**
Q6	**B**
Q7	**D**
Q8.	**A**
Q9.	**C**
Q10.	**C**
Q11.	**D**
Q12.	**D**
Q13.	**C**
Q14.	**A**
Q15.	**D**
Q16.	**D**
Q17.	**C**
Q18.	**B**
Q19.	**B**
Q20.	**A**
Q21.	**A**
Q22.	**B**
Q23.	**B**
Q24.	**C**
Q25.	**D**

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: **CSC304** and Course Name**: Digital Logic Design and Analysis**

Time: 1 hour Max. Marks: 50

==========

For the students:- All the Questions are compulsory and carry equal marks .

Q1.	The binary number (10101) is equivalent to decimal number_____
Option A:	19
Option B:	12
Option C:	27
Option D:	21
Q2.	The decimal number (11.75) is equivalent to binary number_____
Option A:	$(1011.11)_2$
Option B:	$(1000.011)_2$
Option C:	$(1010.11)_2$
Option D:	$(1011.10)_2$
Q3.	The last decimal digits number in octal system is _____
Option A:	5
Option B:	7
Option C:	8
Option D:	9
Q4.	Convert the given following number from binary to Octal (11011100.101010)2
Option A:	$(334.52)_8$
Option B:	$(734.25)_8$
Option C:	$(52.334)_8$
Option D:	$(225.45)_8$
Q5.	According to boolean law: A + 1 = ?
Option A:	A
Option B:	1
Option C:	0
Option D:	(A')
Q6.	The logic gate that will have HIGH or "1" at its output when any one of its inputs is

	HIGH is a(n): _____
Option A:	NOT Operation
Option B:	AND gate
Option C:	OR gate
Option D:	EX-OR gate
Q7.	Which of the following expressions is in the product-of-sums form?
Option A:	AB + CD
Option B:	(AB)(CD)
Option C:	AB(CD)
Option D:	(A + B)(C + D)
Q8.	DeMorgan's theorem states that _____
Option A:	(AB)' = A' + B'
Option B:	(A + B)' = A' * B
Option C:	A' + B' = A'B'
Option D:	(AB)' = A' + B
Q9.	Which of the following equations would accurately describe a 4-input OR gate when A = 1, B = 1, C = 0 and D = 0?
Option A:	1 + 1 + 0 + 0 = 0
Option B:	1 + 1 + 0 + 0 = 01
Option C:	1 + 1 + 0 + 0 = 1
Option D:	1 + 1 + 0 + 0 = 00
Q10.	The indeterminate range of input voltages for a standard TTL device is: _____
Option A:	2.0 to 2.4v.
Option B:	0.8 to 5v.
Option C:	0.8 to 2.0v.
Option D:	2.4 to 5v.
Q11.	Which of the examples below expresses the associative law of addition: _____
Option A:	A(BC) = (AB) + C
Option B:	A + (B + C) = A + (BC)
Option C:	ABC = A + B + C
Option D:	A + (B + C) = (A + B) + C
Q12.	The 3 bits full adder contains _____
Option A:	3 combinational inputs
Option B:	4 combinational inputs
Option C:	6 combinational inputs

Option D:	8 combinational inputs
Q13.	How many 3-line-to-8-line decoders are required for a 1-of-32 decoder?
Option A:	1
Option B:	2
Option C:	4
Option D:	8
Q14.	Which of the following combinations of logic gates can decode binary (1101) ?
Option A:	One 4-input AND gate, one inverter
Option B:	One 4-input AND gate, one OR gate
Option C:	One 4-input NAND gate, one inverter
Option D:	One 4-input AND gate
Q15.	How many 1-of-16 decoders are required for decoding a 7-bit binary number?
Option A:	5
Option B:	6
Option C:	7
Option D:	8
Q16.	How many 4:1 multiplexers are needed to implement 16:1 multiplexer?
Option A:	2
Option B:	3
Option C:	4
Option D:	5
Q17.	How many types of multivibrators are used in digital circuits?
Option A:	2
Option B:	4
Option C:	3
Option D:	5
Q18.	How many flip flops are required to achieve EIGHT states in asynchronous counters?
Option A:	2
Option B:	3
Option C:	8
Option D:	16
Q19.	BCD counter is also called as _____
Option A:	Ripple counter

Option B:	Decade counter
Option C:	Ring counter
Option D:	Johnson counter
Q20.	Bistable multivibrator can be normally seen as _____ in all state.
Option A:	Stable
Option B:	Unstable
Option C:	Saturated
Option D:	Independent
Q21.	When both inputs are set to 1 in JK flip flop then the flip flop shows _____ as output.
Option A:	Toggle state
Option B:	Forbidden state
Option C:	Set state
Option D:	Reset state
Q22.	Flip flops can be an example of _____ multivibrator.
Option A:	Astable
Option B:	Bistable
Option C:	Monostable
Option D:	Saturated condition
Q23.	The terminal output of Decade counter is _____
Option A:	1010
Option B:	1001
Option C:	0000 .
Option D:	1111
Q24.	Which of the following can be considered as an entity in VHDL programming?
Option A:	NAND
Option B:	Nand gate
Option C:	Nand_gate
Option D:	AND
Q25.	In VHDL programming, the Bus is referred to as _____
Option A:	Constant
Option B:	Variable
Option C:	Driver
Option D:	Signal

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC305 and Course Name: DISCRETE STRUCTURE

Time: 1-hour Max. Marks: 50

==========

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	C
Q3.	D
Q4	A
Q5	B
Q6	B
Q7	A
Q8.	C
Q9.	A
Q10.	A
Q11.	D
Q12.	D
Q13.	B
Q14.	A
Q15.	B
Q16.	D
Q17.	A
Q18.	A
Q19.	C
Q20.	B
Q21.	A
Q22.	A
Q23.	A
Q24.	A
Q25.	D

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev2012

Examination: Second Year Semester III

Course Code: CSC305 and Course Name: DISCRETE STRUCTURE

Time: 1-hour Max. Marks: 50

==========

For the students: - All the Questions are compulsory and carry equal marks.

Q1.	The number of elements in the P(S) of S= {{},1, {2,3}} is
Option A:	2
Option B:	4
Option C:	6
Option D:	8
Q2.	If A and B are sets and A∪ B= A ∩ B, then
Option A:	A = Φ
Option B:	B = Φ
Option C:	A = B
Option D:	A= ! B
Q3.	Proposition is _____ sentence which is either true or false but not both.
Option A:	Imperatical
Option B:	Question tag
Option C:	Exclamation
Option D:	Declarative
Q4.	Tautology is_____
Option A:	All values T
Option B:	All values F
Option C:	Both T and F
Option D:	Sometimes T sometimes F
Q5.	For Algorithm verification which is based tool?
Option A:	Pigeonhole Principle
Option B:	Mathematical Induction
Option C:	Extended Pigeonhole Principle
Option D:	Probability
Q6.	Diagraph is _____
Option A:	Deterministic Graph
Option B:	Directed Graph
Option C:	Deleted Graph
Option D:	Diagrammatic Graph
Q7.	Equivalence Relation is _____

Option A:	Reflexive, Symmetric and Transitive
Option B:	Irreflexive, Symmetric and Transitive
Option C:	Reflexive, Antisymmetric and Transitive
Option D:	Reflexive, Symmetric and Asymmetric
Q8.	Partial Order Relation is _____
Option A:	Reflexive, Symmetric and Transitive
Option B:	Irreflexive, Symmetric and Transitive
Option C:	Reflexive, Antisymmetric and Transitive
Option D:	Reflexive, Symmetric and Asymmetric
Q9.	Cartesian Product is denoted by _____
Option A:	A X B
Option B:	A.B
Option C:	(A)(B)
Option D:	A * B
Q10.	An element which is not related to another element is called _____
Option A:	Maximal
Option B:	Minimal
Option C:	Micro
Option D:	Major
Q11.	Following is not type of Function
Option A:	Surjective
Option B:	Onto
Option C:	Bijective
Option D:	Trijective
Q12.	If Dom(f) = A is called
Option A:	Injective
Option B:	Bijective
Option C:	Surjective
Option D:	Everywhere Defined Function
Q13.	How many are born at exactly same hour, minute and second among 1,00,000
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Q14.	Recurrence Relation is also called as
Option A:	Difference Equation
Option B:	Recurrence Relation
Option C:	Complex Equation
Option D:	Diffraction Equation

Q15.	Recursive Formula for defining numeric equation is called as
Option A:	Difference Equation
Option B:	Recurrence Relation
Option C:	Complex Equation
Option D:	Diffraction Equation
Q16.	Which of the following way is not the way for solving Recurrence Relation
Option A:	Equal Roots
Option B:	Complex Roots
Option C:	Distinct Roots
Option D:	Exponential Roots
Q17.	Graph Consist of
Option A:	Vertices and Edges
Option B:	Loops and Circuits
Option C:	Lines and Points
Option D:	Path and Degrees
Q18.	Length of path is
Option A:	Number of Edges in the path
Option B:	Number of Loops in the path
Option C:	Number of Circuit in the path
Option D:	Number of Vertex in the path
Q19.	How many edges must planar graph should have for 7 regions and 5 nodes
Option A:	8
Option B:	9
Option C:	10
Option D:	11
Q20.	What is the total number of nodes in Binary tree having with 20 leaves
Option A:	38
Option B:	39
Option C:	40
Option D:	41
Q21.	The vertex of zero degree is called
Option A:	Root
Option B:	Edge
Option C:	Vertex
Option D:	Length
Q22.	Tree that contains all of the vertices is called
Option A:	Minimum Spanning Tree
Option B:	Binary Tree
Option C:	Ternary Tree
Option D:	Quad Tree

Q23.	Abelian Group is also called as
Option A:	Commutative
Option B:	Associative
Option C:	Distributive
Option D:	Multiplicative
Q24.	A set with number of operations on set is called as
Option A:	Algebraic System
Option B:	Multiplicative System
Option C:	Monoid
Option D:	Singular System
Q25.	Semigroup has following Property
Option A:	Closed, Associative, Inverse
Option B:	Closed, Associative, Identity
Option C:	Closed, Associative, Identity, Inverse
Option D:	Closed, Associative

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev 2012

Examination: Second Year Semester III

Course Code: CSC306 and Course Name: Electronic Circuits and Communication fundamentals

Time: 1 hour Max. Marks: 50

==========

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	A
Q3.	B
Q4	A
Q5	C
Q6	A
Q7	A
Q8.	B
Q9.	C
Q10.	A
Q11.	D
Q12.	D
Q13.	B
Q14.	B
Q15.	B
Q16.	B
Q17.	D
Q18.	B
Q19.	C
Q20.	C
Q21.	C
Q22.	C
Q23.	D
Q24.	D
Q25.	D

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: Rev 2012

Examination: Second Year Semester III

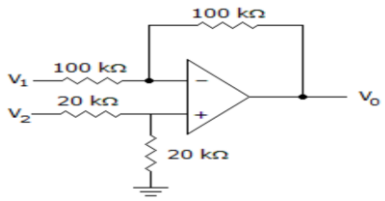
Course Code: CSC306 and Course Name: Electronic Circuits and Communication fundamentals

Time: 1 hour Max. Marks: 50

==========

For the students:- All the Questions are compulsory and carry equal marks .

Q1.	Calculate the Nyquist rate for sampling when a continuous time signal is given by $x(t) = 5 \cos 100\pi t + 10 \cos 200\pi t - 15 \cos 300\pi t$
Option A:	600
Option B:	300
Option C:	150
Option D:	200
Q2.	In digital transmission, the modulation technique that requires minimum bandwidth is
Option A:	Delta modulation
Option B:	PCM
Option C:	DPCM
Option D:	PAM
Q3.	Which of the following type of multiplexing uses pulse code modulation?
Option A:	Frequency division multiplexing
Option B:	Time division multiplexing
Option C:	Code division multiplexing
Option D:	Amplitude limited multiplexing
Q4.	A JFET is also called as _____ transistor.
Option A:	Unipolar
Option B:	bipolar
Option C:	Unijunction
Option D:	bijunction
Q5.	For VGS=0V,the drain current becomes constant when VDS exceeds
Option A:	Cut off
Option B:	VDD
Option C:	Vp
Option D:	0 volt
Q6.	An Amplifier using an Op-Amp with slew rate SR=1v/sec has a gain of 40db. If the amplifier has to faithfully amplify sinusoidal signals from dc to 20Khz without introducing any slew rate induced distortion , then the input signal level exceed

Option A:	795mv
Option B:	395mv
Option C:	79.5mv
Option D:	39.5mv
Q7.	When a step input is given to an Op-Amp integrator, the output will be,
Option A:	A ramp
Option B:	A sinusoidal wave
Option C:	A rectangular wave
Option D:	A triangular wave with dc bias
Q8.	The output of an op-amp increases 8V in 12 µs. the slew rate is
Option A:	90 v/µs
Option B:	0.67 v/µs
Option C:	1.5 v/µs
Option D:	67 v/µs
Q9.	A certain non-inverting amplifier has R_i of 1 kΩ and R_f of 100 kΩ. The closed-loop voltage gain is
Option A:	1,00,000
Option B:	1,000
Option C:	101
Option D:	100
Q10.	Determine the output voltage when v1=v2=1V 
Option A:	0V
Option B:	-2V
Option C:	1V
Option D:	2V
Q11.	How many op-amps are required to implement following equation? $V_o = \frac{R_3}{R_1 + R_3} \frac{R_2 + R_4}{R_2} V_1 - \frac{R_4}{R_2} V_2$
Option A:	2
Option B:	3
Option C:	4
Option D:	1
Q12.	What is the line connecting the positive and negative peaks of the carrier waveform called?

Option A:	Peak line
Option B:	Maximum amplitude ceiling
Option C:	Modulation index
Option D:	Envelope
Q13.	What is the reference line for modulation signal?
Option A:	Zero line
Option B:	Carrier peak line
Option C:	Modulated peak line
Option D:	Un-modulated peak line
Q14.	What happens when the amplitude of the modulating signal is greater than the amplitude of the carrier?
Option A:	Decay
Option B:	Distortion
Option C:	Amplification
Option D:	Attenuation
Q15.	What is the effect of distortion?
Option A:	Total information loss
Option B:	Error information
Option C:	Attenuated information
Option D:	Amplified information
Q16.	In India _____ modulation is used for radio transmission.
Option A:	Frequency
Option B:	Amplitude
Option C:	Phase
Option D:	Pulse
Q17.	In Super heterodyne receiver , the input at mixer stage is
Option A:	IF and RF
Option B:	RF and AF
Option C:	IF and AF
Option D:	RF and local oscillator signal
Q18.	The IF is 455Khz. If the radio receiver is tuned to 855Khz, the local oscillator frequency is _____
Option A:	455Khz
Option B:	1310Khz
Option C:	1500Khz
Option D:	1520Khz
Q19.	The output voltage of phase detector is
Option A:	Phase voltage
Option B:	Free running voltage
Option C:	Error voltage
Option D:	Lock voltage

Q20.	At which state the phase-locked loop tracks any change in input frequency?
Option A:	Free running state
Option B:	Capture state
Option C:	Phase locked state
Option D:	Middle of free running and capture state
Q21.	Which of the following is the simplest form of tuned-circuit frequency discriminator?
Option A:	Foster-Seeley discriminator
Option B:	Ratio detector
Option C:	slope detector
Option D:	PLL detector
Q22.	PAM stand for
Option A:	Pulse Analogue Modulation
Option B:	Phase Analogue Modulation
Option C:	Pulse Amplitude Modulation
Option D:	Phase Amplitude Modulation
Q23.	Which of the following is the process of ‘aliasing’?
Option A:	Peaks overlapping
Option B:	Phase overlapping
Option C:	Amplitude overlapping
Option D:	Spectral overlapping
Q24.	The sampling frequency of a signal is Fs=2000 samples per second. Find its Nyquist interval.
Option A:	0.5 sec
Option B:	5 msec
Option C:	5 sec
Option D:	0.5 msec
Q25.	Which of the following is considered as an indirect method of generating FM?
Option A:	Reactance modulator
Option B:	Balanced modulator
Option C:	Varactor diode modulation
Option D:	Armstrong system

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: Rev 2012

Examination: SE Semester III

Course Code: CSC305 and Course Name: Discrete Structure

Time: 2 hour Max. Marks: 80

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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
1.	B
Q2.	C
Q3.	A
Q4	B
Q5	B
Q6	D
Q7	D
Q8.	A
Q9.	D
Q10.	D
Q11.	A
Q12.	D
Q13.	B
Q14.	B
Q15.	C
Q16.	C
Q17.	A
Q18.	C
Q19.	A
Q20.	B

Q2

A) $n(S) = 500$

$n(t) = 40\%$ of $500 = 200$

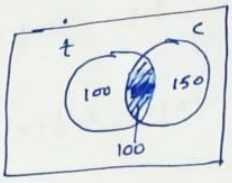
$n(c) = 50\%$ of $500 = 250$

$n(t \cap c) = 20\%$ of $500 = 100$

$n(t \cup c) = n(t) + n(c) - n(t \cap c)$

$= 200 + 250 - 100$

$= 350$



No: of Person who drink only tea $= 200 - 100$
$= 100$

No. of person who drink only coffeee $= 250 - 100$
$= 150$

No. of person who neither drink tea nor coffee $= n(t \cup c)'$
$= 500 - 350$
$= 150$

—x—

B) Reflexive – If a is an arbitrary integer then
$a - a = 0 = 0 \cdot m$ Thus $a \equiv a \pmod m$

Symmetric – If $a \equiv b \pmod m$ then $a - b = k \cdot m$ for some integer k where $k = 5$. Thus $b - a = (-k) \cdot m$ is also divisible by m & so $b \equiv a \pmod m$.

Transitive – Suppose $a \equiv b \pmod m$ & $b \equiv c \pmod m$.
Then $a - b = k \cdot m$ and $b - c = l \cdot m$ for some integer k & l then $a - c = (a - b) + (b - c) = k \cdot m + l \cdot m = (k + l) \cdot m$ is also divisible by m. That is $a \equiv c \pmod m$

$\therefore$ R is an equivalance relation.

$\therefore E(0) = \{\ldots, -10, -5, 0, 5, 10, 15, \ldots\}$

$E(1) = \{\ldots -9, -4, 1, 6, 11, 16, \ldots\}$

$E(2) = \{\ldots -8, -3, 2, 7, 12, 17, \ldots\}$

$E(3) = \{\ldots -7, -2, 3, 8, 13, 18, \ldots\}$

$E(4) = \{\ldots -6, -1, 4, 9, 14, 19 \ldots\}$

This is the partition of Z induced by Z/R

Q 2

c) $gof = g(f(x)) = g(x+2)$
$= (x+2)^2 = x^4 + 4x + 4$

$fogof = f(x^2+4x+4) = (x^2+4x+4) + 2$
$= x^2+4x+6$

iii) $fog = f(g(x)) = f(x^2) = x^2+2$

$gofog = g(x^2+2) = (x^2+2)^2 = x^4+4x^2+4$

— x —

d) Given recurrence relation

$a_n - 3a_{n-1} + 2a_{n-2} = 0$

Let $a_n = r^n$ be a solution

∴ characteristic eqn is

$r^2 - 3r + 2 = 0$

∴ $r = 1, 2$

The roots are real, rational & distinct.

General solution be $a_n = b_1 \cdot 1^n + b_2 \cdot 2^n$.

putting $n=1$ $\quad a_1 = b_1 + 2b_2 = 5$

Putting $n=2$ $\quad a_2 = b_1 + 4b_2 = 3$

on solving eqn we get $b_1 = 7$, $b_2 = -1$

Hence explicit solution of the recurrence relation

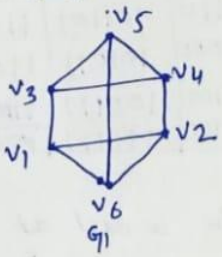
$a_n = 7 \cdot 1^n - 2^n$

$a_n = 7 - 2^n$

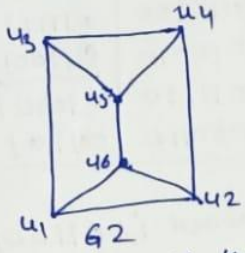
— x —

Q2

e) Both the graphs have same number of edges. i.e. 9 & same no. of vertices i.e. 6.



G1



G2

In bothe the graphs all the vertices are of degree 3

Correspondence $v_1 \to u_1$, $v_2 \to u_2$, $v_3 \to u_3$
$v_4 \to v_4$, $v_5 \to u_5$, $v_6 \to u_6$

∴ Graph G1 & G2 are Isomorphic graph

— x —

f) First compute $e_H : B^3 \to B^6$.

Since $B = \{0, 1\} \Rightarrow B^3 = \{000, 001, 010, 100, 011, 101, 110, 111\}$

$e(000) = 000\, x_1 x_2 x_3$

$x_1 = 0.1 + 0.1 + 0.0 = 0$

$x_2 = 0.0 + 0.1 + 0.1 = 0$

$x_3 = 0.0 + 0.0 + 0.1 = 0$

∴ $e(000) = 000000$

$e(001) = 001011$

$e(010) = 010110$

$e(011) = 011101$

$e(100) = 100100$

$e(101) = 101111$

$e(110) = 110010$

$e(111) = 111001$

Decoding Table

000000	001011	010110	011101	100100	101111	110010	111001
000001	001010	010111	011100	100010	101110	110011	111000
000010	001001	010100	011111	100110	101101	110000	111011
000100	001111	010010	011001	100000	101011	110110	111110
001000	000011	011110	010101	101100	100111	111010	110001
010000	011011	000110	001101	110100	111111	100010	101001

i) Now the received word is 011001. The word at the top is 011101

since e(011) = 011101 we decode 011001 as 011

i.e. d(011101) = 011

ii) The received word is. 101001.

The word at the top is. 111001

since e(111) = 111001

∴ d(101001) = 111

iii) The received word is. 111010.

The word at the top is 110010.

since e(110) = 110010

∴ d(111010) = 110

Q3

A) $\sim(P \wedge q) \to (\sim P \vee (\sim P \vee q))$

$\Rightarrow \sim(P \wedge q) \to ((\sim P \vee \sim P) \vee q)$ — By Associativity

$\Rightarrow \sim(P \wedge q) \to (\sim P \vee q)$ — By $P \vee P = P$

$= \sim\sim(P \wedge q) \vee (\sim P \vee q)$ — Implication $P \to q \equiv \sim P \vee q$

$= (P \wedge q) \vee (\sim P \vee q)$ — $\sim\sim P = P$

$= [(P \wedge q) \vee \sim P] \vee q$ — Associativity

$= [(P \vee \sim P) \wedge (q \vee \sim P)] \vee q$ — By distributivity

$= [t \wedge (q \vee \sim P)] \vee q$ — $P \vee \sim P = t$

$= (q \vee \sim P \vee q)$ — $t \wedge P = P$

$= \sim P \vee q$

B) $W_0 = M_R =$

	1	2	3	4
1	0	1	0	0
2	1	0	1	0
3	0	0	0	1
4	0	0	0	0

observe 1st row 1st col^{n}. $(p_i, q_j) = 2, 2$

$$W_1 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

observe 2nd row 2nd col^{n} $p_i = 1, 2$ $q_j = 1, 2, 3$

$(p_i, q_j) = (1,1), (1,2), (1,3), (2,1), (2,2), (2,3)$

$$W_2 = \begin{bmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

observe 3rd row & 3rd col^{n} $p_i = 1, 2$ $q_j = 4$

$(p_i, q_j) = (1,4), (2,4)$

$$W_3 = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

observe 4th row, 4th coln as $a_{ij} = 0$

∴ no change i

$$W_4 = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

∴ $R^{\infty} = \{(1,1)(1,2),(1,3),(1,4)(2,1)(2,2),(2,3),(2,4),(3,4)\}$

— x 2

c) Pigeonhole principle – If n pigeons are assigned to m pigeonholes & $m < n$ then atleast one pigeonhole contains two or more pigeons

Extended pigeonhole principle – If there are m pigeonholes & more than $2m$ pigeons, then atleast one pigeonhole will have more than two pigeons & so on

consider dictionaries as pigeonholes & pages as pigeons.

If we place pages in 30 pigeonholes

i.e. $\frac{61327}{30} = 2044.23$

If $2044 \times 30 = 61320$ pages in 30 dictionaries.

Each dictionary have 2044 pages. Since there are 61327 pages atleast one dictionary will have 2045 pages

By extended pigeonhole principle

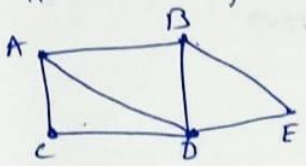
$$\left\lceil \frac{61327 - 1}{30} \right\rceil + 1 = 2044 + 1 = 2045$$

∴ Atleast one dictionary will have 2045 pages.

Q3.

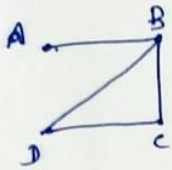
D) Euler path - A path in a graph is called Euler path if it includes all edges but each edge exactly ones & vertex may be repeated.

Hamiltonian path - A path in G which contains all the vertices of G but exactly ones is called a Hamiltonian path



Since the vertices A & B are of odd degree, the graph does not have Eulerian cycle

Eulerian path - A B E D C A D B



Since the degree of vertex A is not equal greater than or equal to $n/2 = 2$

∴ no Hamiltonian cycle

Hamiltonian path - A B C D.

—x—

E) Edges in sorted order

1 : (A, D), (C, D), (B, E), (D, E)

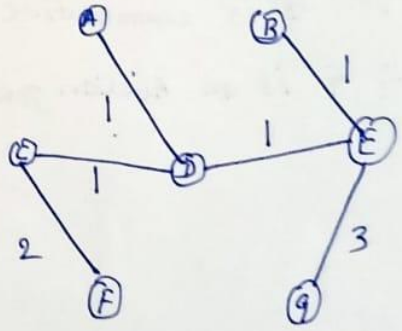
2 : (A, B), (C, F), (A, C)

3 : (E, G)

5 : (D, G), (B, D)

6 : (D, F)

10 : (F, G)



Q3

f)

⊛	1	2	3	4
1	1	2	3	4
2	2	4	1	3
3	3	1	4	2
4	4	3	2	1

Sol:- From the table it is clear ⊛ is binary operation

Q1: From the table ⊛ is associative.

$2 ⊛ (3 ⊛ 4) = 2 ⊛ 2 = 4$

$(2 ⊛ 3) ⊛ 4 = 1 ⊛ 4 = 4$

Q2: First row & first col^{n} show that 1 is identity element for ⊛

Q3: Inverse exist for element

$2^{-1} = 3.$ $3^{-1} = 2$ $4^{-1} = 4.$

Q4: Further

$a ⊛ b = b ⊛ a$

$2 ⊛ 4 = 4 ⊛ 2$

$3 = 3$

i.e. ⊛ is commutative

∴ G is an Abelian group.

University 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: Rev 2012

Examination: SE Semester III

Course Code: CSC305 and Course Name: Discrete Structure

Time: 2 hour Max. Marks: 80

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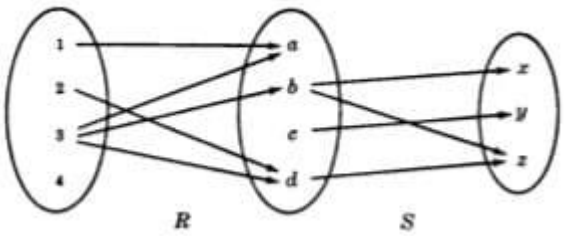
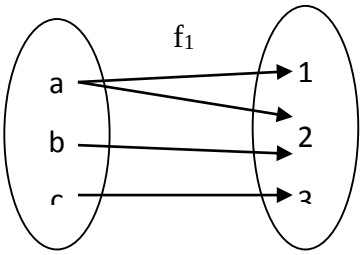
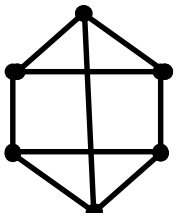
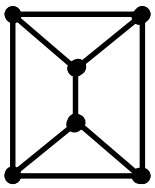
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Let S={a, b, c, d, e, f, g, h} which of the following is partition of S
Option A:	{{a,b,c}, {d,e,f}, {f,g,h}}
Option B:	{{a,b,c}, {d,e,f}, {g,h}}
Option C:	{{a,b},{d,e,f},{g,h}}
Option D:	{{a,c},{b,c},{d,e},{f,g,h}}
2.	If A and B are sets and A∪ B= A ∩ B, then
Option A:	A = Φ
Option B:	B = Φ
Option C:	A = B
Option D:	A≠ B
3.	If the position of the premise and conclusion of an implication are interchanged then it is called _____ of that implication
Option A:	Converse
Option B:	Inverse
Option C:	Contrapositive
Option D:	Contrast
4.	I. ¬∀x(P(x)) II. ¬∃x(P(x)) III. ¬∃x(¬P(x)) IV. ∃x(¬P(x)) which of the above two are equivalent?
Option A:	I and III
Option B:	I and IV
Option C:	II and III
Option D:	II and IV
5.	Let B = {y ∈ Z | y = 18b − 2 for some integer b} and C = {z ∈ Z | z = 18c + 16 for some integer c}. Then
Option A:	C ⊆ B
Option B:	B = C

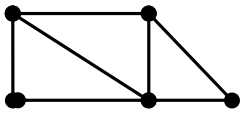
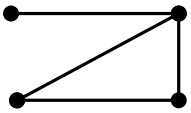
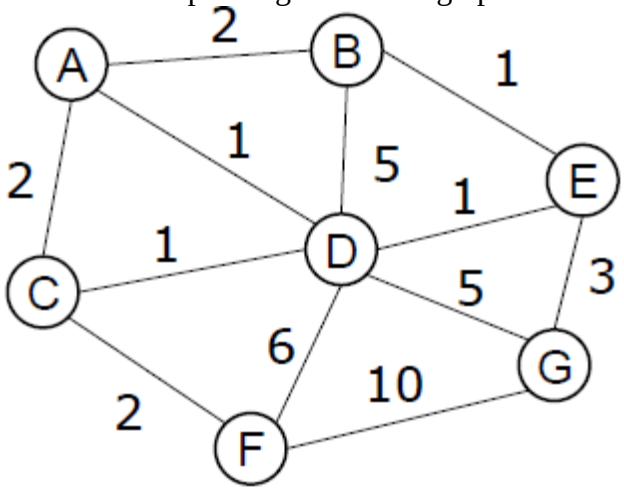
Option C:	$B \neq C$
Option D:	$B \subseteq C$
6.	$M_R=\begin{bmatrix}1 & 1 & 0 & 1\\ 0 & 1 & 0 & 0\\ 1 & 0 & 0 & 1\\ 0 & 0 & 0 & 1\end{bmatrix}$
Option A:	Matrix M_R is reflexive
Option B:	Matrix M_R is irreflexive
Option C:	Matrix M_R is symmetric
Option D:	Matrix M_R neither reflexive not irreflexive
7.	Let A={1,2,3} and R={(1,1),(1,2),(3,1),(3,3)} Find symmetric closure of R
Option A:	R_1={(1,1),(1,2),(3,1),(3,3),(2,2)}
Option B:	R_1={(1,1),(1,2),(3,1),(3,3),(2,2),(2,1)}
Option C:	R_1={(1,1),(1,2),(3,1),(3,3),(2,2),(2,1),(1,3)}
Option D:	R_1={(1,1),(1,2),(3,1),(3,3),(2,1),(1,3)}
8.	If the relations R and S are as given below , then R o S is given by ---------- 
Option A:	{ (2, z), (3, x), (3, z) }
Option B:	{ (1, x), (2, y), (3, z), (4,a) }
Option C:	{ (1, a), (2, d), (3, b) }
Option D:	Does not exist
9.	Let A={2,3,6,12,24,36} with partial order of divisibility then least element of A is
Option A:	2
Option B:	36
Option C:	2,3
Option D:	No least element
10.	For $P(n): 1^2+3^2+5^2+\cdots+(2n-1)^2=\frac{n(2n-1)(2n+1)}{3}$, L.H.S of P(k+1) is
Option A:	$\frac{k(2k-1)(2k+1)}{3}$
Option B:	$\frac{(k+1)(2k-1)(2k+1)}{3}$
Option C:	$\frac{(k+1)(2k-1)(2k+3)}{3}$

Option D:	$\frac{(k+1)(2k+1)(2k+3)}{3}$
11.	
Option A:	f1 is not a function
Option B:	f1 is a one to one function
Option C:	f1 is a onto function
Option D:	f1 is a one to one and onto function
12.	Let f be a function from R to R with f (x) = x^2. Which of the following statement is true?
Option A:	f is an one to one function
Option B:	f is a bijective function
Option C:	f is an invertible function
Option D:	f is an into function
13.	Ordinary generating function of the sequence 1,1,1,…….
Option A:	$(1-x)$
Option B:	$(1-x)^{-1}$
Option C:	$(1+x)^{-1}$
Option D:	e^x
14.	In the arithmetic progression {5,9,13,17,…….} the recurrence relation is
Option A:	$a_n = a_{n-1} + 4$, $a_1=5$, $n > 2$
Option B:	$a_n = a_{n-1} + 4$, $a_1=5$, $n \geq 2$
Option C:	$a_n = a_{n+1} + 4$, $a_1=5$, $n \geq 2$
Option D:	$a_n = a_n + 4$, $a_1=5$, $n \geq 2$
15.	Which of the following is not type of lattice
Option A:	Complemented lattice
Option B:	Distributive lattice
Option C:	Hasse diagram
Option D:	Bounded lattice
16.	Number of edges in complete graph with 7 vertices
Option A:	20
Option B:	19
Option C:	21
Option D:	14
17.	The vertex of zero degree is called
Option A:	Root

Option B:	Edge
Option C:	Vertex
Option D:	Length
18.	Minimum number of colors required for vertex coloring of a graph is called?
Option A:	vertex matching
Option B:	chromatic index
Option C:	chromatic number
Option D:	color number
19.	Abelian Group is also called as
Option A:	Commutative
Option B:	Associative
Option C:	Distributive
Option D:	Multiplicative
20.	An (m ,n) coding function $e: B^m \rightarrow B^n$ can detect k or less errors if and only if its minimum distance is
Option A:	At least k+2
Option B:	At least k+1
Option C:	At least 2k+1
Option D:	At least 2k+2

Q2	**Solve any Four out of Six (5 marks each)**
A	In a group of 500 persons 40% drink tea, 50% drink coffee and 20% drink both. Find the number of persons who drink i)only tea ii)only coffee iii) Neither tea nor coffee
B	Let R be a relation on the set of integers Z defined by aRb if and only if $a \equiv m$ (mod 5). Prove that R is equivalence relation. Find Z/R.
C	If f:R→R and g: R→R are defined by f(x)=x+2 and g(x)=x^2, Calculate fogof and gofog
D	Solve the recurrence relation $a_n=3a_{n-1}-2a_{n-2}$ with initial condition $a_1=5$, $a_2=3$
E	Show that following two graphs are isomorphic.  **G1**  **G2**
F	Let H= $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be a parity check matrix. Decode the following words relative to maximum likelyhood decoding

	function e_H . i) 011001 ii)101001 iii) 111010

Q3	**Solve any Four out of Six (5 marks each)**
A	Using laws of logic simplify ~ $(p \wedge q) \rightarrow (\sim p \vee (\sim p \vee q))$
B	Let A={1,2,3,4} and R={(1,2), (2,3), (3,4), (2,1)}. Find transitive closure of R using Warshall's Algorithm
C	State Pigeonhole principle and extended pigeonhole principle. Show that if 30 dictionaries in a library contain total 61327 pages, then one of the dictionaries has atleast 2045 pages.
D	Define Euler Path and Hamiltonian path. i) Determine Euler path in graph (a) ii) Determine Hamiltonian path in graph (b)  (a)  (b)
E	Find the minimal spanning tree of the graph shown in figure. 
F	Prove that set G={1,2,3,4} is an Abelian group under multiplication modulo 5.