K. J. Somaiya Institute of Engineering and Information Technology
Sion, Mumbai - 400022
NAAC Accredited Institute with 'A' Grade
NBA Accredited 3 Programs
(Computer Engineering, Electronics & Telecommunication Engineering and Electronics Engineering)
Permanently Affiliated to University of Mumbai

EXAMINATION TIME TABLE (JANUARY 2021)

PROGRAMME - S.E. (Computer) (REV. -2012) (CBSGS)

SEMESTER - III

Days and Dates	Time	Course Code	Paper
08 January 2021	12:30 p.m. to 02:30 p.m.	CSC301	APPLIED MATHEMATICS-III
11 January 2021	12:30 p.m. to 02:30 p.m.	CSC302	OBJECT ORIENTAED PROGRAMMING METHODOLOGY
13 January 2021	12:30 p.m. to 02:30 p.m.	CSC303	DATA STRUCTURES
15 January 2021	12:30 p.m. to 02:30 p.m.	CSC304	DIGITAL LOGIC DESIGN AND ANALYSIS
18 January 2021	12:30 p.m. to 02:30 p.m.	CSC305	DISCRETE STRUCTURES
20 January 2021	12:30 p.m. to 02:30 p.m.	CSC306	ELECTRONIC CIRCUITS AND COMMUNATION FUNDAMENTALS

Important Note: ● Change if any, in the time table shall be communicated on the college web site.

Mumbai
20th December, 2020.

Principal

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: R-2012

Examination: Second Year Semester: III

Course Code: CSC301 and Course Name: APPLIED 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.	The Laplace transform of $\int_0^t \frac{\sin u}{u} du$ is
Option A:	$\cot^{-1} s$
Option B:	$\frac{1}{s}\tan^{-1} s$
Option C:	$\frac{1}{s}\cot^{-1} s$
Option D:	$tan^{-1}s$
2	Laplace transform of $f(t) = t\, sin4t$ is
Option A:	$\frac{4}{s^2+16}$
Option B:	$\frac{4s}{(s^2+16)^2}$
Option C:	$\frac{8s}{(s^2+16)^2}$
Option D:	$\frac{8s}{(s^2+4)^2}$
3	The Laplace transform of $\cosh at$ is
Option A:	$\frac{s^2}{s^2-a^2}$
Option B:	$\frac{s}{s^2+a^2}$
Option C:	$\frac{s}{s^2-a^2}$
Option D:	$\frac{1}{s^2-a^2}$
4	Evaluate $L^{-1}\left[\frac{1}{s(s-3)}\right]$.
Option A:	$\frac{1}{3}+\frac{1}{3}e^{3t}$
Option B:	$\frac{-1}{3}e^{3t}+\frac{1}{3}e^{3t}$

Option C:	$\frac{1}{3}(e^{3t}-1)$
Option D:	$\frac{1}{3}(1-e^{3t})$
5.	The inverse Laplace transform of $\frac{3s+4}{s^2+16}$ is
Option A:	$\cos 4t+\sin 4t$
Option B:	$3.\cos 4t+\sin 4t$
Option C:	$\sin 4t-\cos 4t$
Option D:	$3.\cos 3t+\sin 3t$
6.	If $f(z)=e^z$ is an analytic function, then real part is given by
Option A:	$e^x \cos y$
Option B:	$\cos y$
Option C:	$-e^x \sin y$
Option D:	$\sin y$
7.	A function $u(x,y)$ is harmonic if and only if,
Option A:	$u_{xx}+u_{yy}=0$
Option B:	$u_x+u_y=0$
Option C:	$u_{xy}+u_{yx}=0$
Option D:	$u_x-u_y=0$
8.	If $f(z)=2x+ay+i(cx+by)$ is analytic then a, b, c equals to
Option A:	$c=2$ *and* $a=b$
Option B:	$a=2$ *and* $b=-c$
Option C:	$b=2$ *and* $a=-c$
Option D:	$a=b=c=2$
9.	Cauchy- Riemann 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:	$u_x=v_y, u_y=-v_x$
10.	In half range *sine* Fourier series, we assume the function to be
Option A:	Odd function
Option B:	Even function
Option C:	Can't be determined

Option D:	Can be anything
11.	Which of the following function is even function?
Option A:	e^x
Option B:	$x+x^2$
Option C:	$4-x^2$
Option D:	$x+x^3$
12	If $f(x) = \cos x$ defined in $(-\pi,\pi)$then the value Fourier coefficient b_n is
Option A:	0
Option B:	π
Option C:	$\frac{\pi}{(n^2-1)}$
Option D:	$\frac{2\pi}{(n^2-1)}[(-1)^n-1]$
13	For the Fourier Series$\frac{a_0}{2}+\sum a_n\, cosnx+\sum b_n\, sinnx$ of the function $f(x) = x^3-x^5, -\pi \le x \le \pi$, the value of $a_n$is _____
Option A:	$\frac{(-1)^n}{n^8}$
Option B:	$\frac{(-1)^n}{n^4}-\frac{(-1)^{n+1}}{n^8}$
Option C:	0
Option D:	$\frac{1}{n^8}$
14	If $\Phi = x\,z^2 - 5\,yz + xz$, find $\nabla\,\Phi$ at $(1,-1,2)$
Option A:	$i - 10\,j + 10\,k$
Option B:	$6i - 10\,j$
Option C:	$6i - 10\,j + 10\,k$
Option D:	$6i + 10\,j + 10\,k$
15	If $\bar{f}$ is a vector points functions such that $\nabla.\bar{f} = 0$ then $\bar{f}$ is called
Option A:	Conservative
Option B:	Solenoidal
Option C:	Constant vector
Option D:	Irrotational
16	Divergence and Curl of a vector field are
Option A:	Scalar & Vector
Option B:	Vector & Vector
Option C:	Vector & Scalar
Option D:	Scalar & Scalar
17	The curl of vector field $\vec{f}(x,y,z) = x^2\hat{\imath} + 2z\,\hat{\jmath} - y\hat{k}$ is

Option A:	$-3\hat{j}$
Option B:	$-3\hat{k}$
Option C:	$-3\hat{\imath}$
Option D:	0
18	Find $Z\{1\}$ for $k \geq 0$
Option A:	$\frac{z}{z-1}$, $\lvert z\rvert > 1$
Option B:	$\frac{z}{z+1}$, $\lvert z\rvert > 1$
Option C:	$\frac{1}{z-1}$, $\lvert z\rvert > 1$
Option D:	$\frac{1}{z+1}$, $\lvert z\rvert > 1$
19	Find the inverse Z-transform of $\frac{z}{z-a}$, $\lvert z\rvert > a$
Option A:	$\{a^k\}$, $k \geq 0, \lvert z\rvert > a$
Option B:	$\{(-a)^{k-1}\}$, $k \geq 0, \lvert z\rvert > a$
Option C:	$\{a^{k-1}\}$, $k \geq 0, \lvert z\rvert > a$
Option D:	$\{(-a)^k\}$, $k \geq 0, \lvert z\rvert > a$
20.	Z –transform of the sequence $\{f(k)\}$is given by
Option A:	$Z\{f(k)\} = \sum_{k=-\infty}^{\infty} f(k)z^k$
Option B:	$Z\{f(k)\} = \sum_{k=-\infty}^{\infty} z^k$
Option C:	$Z\{f(k)\} = \sum_{k=-\infty}^{\infty} f(k)z^{-k}$
Option D:	$Z\{f(k)\} = \sum_{k=-\infty}^{\infty} f(k)$
Q.2	**Solve any four questions out of six questions of five marks each**
A	Find the Laplace transform of $\int_0^t ue^{-3u} \sin 4u$.
B	Find the Laplace transform of $costcos2tcos3t$.
C	If $f(z) = x^2 + 2axy + by^2 + i(cx^2 + 2dxy + y^2)$ is analytic then find the values of a, b, c and d
D	Find the harmonic conjugate of $u = 2x - x^3 + 3xy^2$.

E	Obtain half range Fourier cosine series for $(x) = sinx \ \ , x \in (0, \pi)$.
F	Using Greens theorem in the plane , evaluate $\int_c \ (x^2 - y)dx + (2y^2 + x)dy$ around the boundaryof the region defined by $y = x^2$ and $y = 4$.
Q.3	**Solve any four questions out of six questions of five marks each**
A	Find the value of $L^{-1}\left\{\frac{s}{(s^2+3^2)^2}\right\}$
B	Find the analytic function whose real part is $x^2 - y^2 + 3y - 2x + 3$
C	Find half range Fourier cosine series for $f(x) = x$, $0 < x < 2$.
D	Find the z-transform of $\left(\frac{1}{3}\right)^{\lvert k \rvert}$.
E	Prove that a vector field $\bar{F} = (x^2 + xy^2)\, i + (y^2 + x^2 y)\, j$ is irrotational .
F	Find the inverse z-transform of $F(z) = \frac{z}{(z-1)(z-2)}$, $\lvert z \rvert > 2$

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: R-2012

Examination: Second Year Semester: III

Course Code: CSC301 and Course Name: APPLIED MATHEMATICS III

Time: 2 hour Max. Marks: 80

==========

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

University of Mumbai

Examination 2020 under cluster __ (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: **CSC302** Course Name: **Object Oriented Programming Methodology**

Time: 2 hour Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. (2 Marks Each) Total=40Marks**
1.	What is byte code in Java?
Option A:	Code generated by a Java compiler.
Option B:	Code generated by a Java Virtual Machine.
Option C:	Name of Java source code file.
Option D:	Block of code written inside a class.
2.	What does the expression float a = 35 / 0 return?
Option A:	0
Option B:	Not a Number
Option C:	Infinity
Option D:	Run time exception
3.	Which of these is not a bitwise operator?
Option A:	&
Option B:	^
Option C:	|
Option D:	<=
4.	Which of the following is used with the switch statement?
Option A:	continue
Option B:	exit
Option C:	break
Option D:	do
5.	Which of the following loops will execute the body of loop even when condition controlling the loop is initially false?
Option A:	do-while
Option B:	while
Option C:	for
Option D:	none of the mentioned
6.	What is the extension of java code files?
Option A:	.class
Option B:	.java
Option C:	.txt
Option D:	.js

7.	Which of these values can a boolean variable contain?
Option A:	true or false
Option B:	0 or 1
Option C:	Any integer value
Option D:	True
8.	Which of these keywords is used to make a class?
Option A:	class
Option B:	struct
Option C:	int
Option D:	byte
9.	Which of this keyword can be used in a subclass to call the constructor of superclass?
Option A:	super
Option B:	this
Option C:	extent
Option D:	extends
10.	If a class inheriting an abstract class does not define all of its function then it will be known as?
Option A:	a simple class
Option B:	static class
Option C:	final class
Option D:	abstract
11.	What is it called if an object has its own lifecycle and there is no owner?
Option A:	Aggregation
Option B:	Composition
Option C:	Encapsulation
Option D:	Association
12.	Which of these method of class String is used to extract a single character from a String object?
Option A:	CHARAT()
Option B:	chatat()
Option C:	charAt()
Option D:	ChatAt()
13.	Which of these class object can be used to form a dynamic array?
Option A:	Map
Option B:	Vector
Option C:	Array
Option D:	Inheritance
14.	Which of the following is the correct way of implementing an interface Salary by class Manager?
Option A:	class Manager extends Salary {}
Option B:	class Manager implements Salary {}

Option C:	class Manager imports Salary {}
Option D:	class Manager exports Salary {}
15.	Topmost Parent Class in Exception classes hierarchy is
Option A:	ArithmeticException
Option B:	Throwable
Option C:	Object
Option D:	Exception
16.	If multiple catch blocks are used then
Option A:	either super or sub class can be caught first.
Option B:	The superclass exception must be caught first.
Option C:	The superclass exception cannot caught first.
Option D:	The subclass exception cannot caught first
17.	Which keyword is used to specify that the exception is thrown by method.
Option A:	throw
Option B:	throws
Option C:	catch
Option D:	finally
18.	The method that starts thread execution
Option A:	resume()
Option B:	start()
Option C:	run()
Option D:	init()
19.	The method of inbuilt class Thread to check if current thread is still running is
Option A:	isRunning()
Option B:	Running()
Option C:	isAlive()
Option D:	Alive()
20.	Which is the correct order of an applet lifecycle?
Option A:	Applet is started, initialized, painted, destroyed, stopped
Option B:	Applet is initialized, started, painted, stopped, destroyed
Option C:	Applet is painted, started, stopped, initialized, destroyed
Option D:	None of above

Q2.	
A	**Solve any Two** **5 marks each**
i.	Write difference between POP and OOP.
ii.	Write a program to calculate area of Rectangle using abstract class.
iii.	Explain an Applet life cycle with the help of diagram.
B	**Solve any One** **10 marks each**
i.	Explain how Exceptions are handled in Java using the keywords Try, catch, finally, throw and throws with suitable example.
ii.	Write a Program in java to add two matrices of size m*n.
Q3.	
A	**Solve any Two** **5 marks each**
i.	Write a detailed note on : System.arraycopy()
ii.	Explain Inheritance & its types in java.
iii.	Explain Aggregation with suitable example.
B	**Solve any One** **10 marks each**
i.	Write a Java Multithreaded program that starts two threads. A SlashThread prints / character and StarThread prints * character. The threads start running to display the output as mix of / and *.
ii.	Write a program in java to check if a string is palindrome or not using StringBuffer object.

University of Mumbai

Examination 2020 under cluster __ (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: **Comps**

Curriculum Scheme: Rev 2012

Examination: SE Semester III

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

Time: 2 hour Max. Marks: 80

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

University of Mumbai

Examination 2020 under cluster __ (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: Rev2012

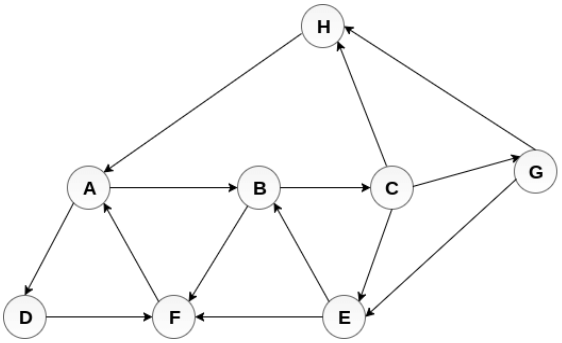
Examination: SE Semester III

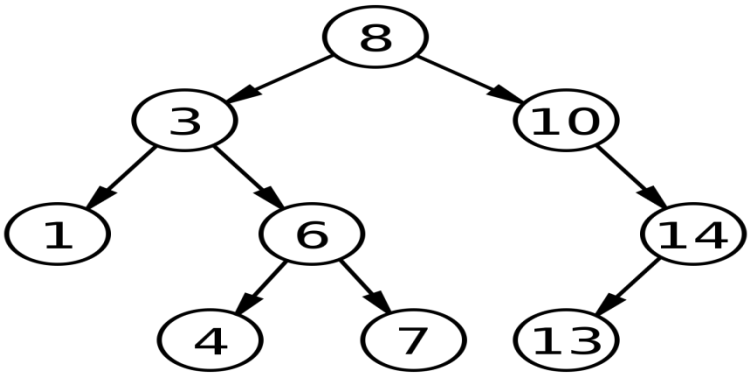
Course Code: CSC303 and Course Name: Data Structures

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 of the following is not Primitive Data Type?
Option A:	char
Option B:	byte
Option C:	int
Option D:	array
2.	Which of the following is Linear Data Structure?
Option A:	Binary Tree
Option B:	Stack
Option C:	Graph
Option D:	Binary Search tree
3.	Which is not the application of STACK?
Option A:	Infix to postfix conversion
Option B:	Postfix Evaluation
Option C:	Resource Allocation
Option D:	Recursion
4.	Which of the following operation perform very efficiently on Doubly Linked list over single linked List?
Option A:	Count
Option B:	Insert
Option C:	Delete
Option D:	Display
5.	When Linked list not exist Head Pointer points to_____.
Option A:	-1
Option B:	1
Option C:	SIZE
Option D:	NULL
6.	What is stack UNDERFLOW condition?
Option A:	To POP from empty stack
Option B:	To POP from full stack
Option C:	To PUSH on empty stack

Option D:	To PUSH on full stack
7.	 **Adjacency Lists** A : B, D B : C, F C : E, G, H G : E, H E : B, F F : A D : F H : A What is output sequence of DFS traversal on above Graph?
Option A:	H → A → D → F → B → C → E → G
Option B:	H → A → F → D → B → C → G → E
Option C:	H → A → D → F → C → B → G → E
Option D:	H → A → D → F → B → C → G → E
8.	What is condition to check Linear Queue is actually full?
Option A:	front=-1,rear=-1;
Option B:	front=0,rear=size-1;
Option C:	front=0,rear=size;
Option D:	front=-1,rear=size-1;
9.	What will be the maximum value of rear if we implement Linear Queue using array and Queue_SIZE is 10
Option A:	8
Option B:	9
Option C:	10
Option D:	11
10.	The result evaluating the postfix expression 2 5 * 7 + 4 – is by considering every character as single digit.
Option A:	13
Option B:	11
Option C:	12
Option D:	14
11.	The postfix expression for the infix expression a+(b*c+d)*e is:
Option A:	abc*de+*+
Option B:	ab*cde+*+
Option C:	abcde**++
Option D:	abc*d+e*+
12.	The following sequence of operations is performed on stack: PUSH(S),PUSH(P),PUSH(Q),PUSH(T),POP,POP,POP,PUSH(S),PUSH (T),POP,POP The sequence of the value popped out is:
Option A:	TPQTS
Option B:	TQTPS
Option C:	TQPTS
Option D:	TQPST

13.	To search 34 from 10,15,34,38,43,52,64,68,88 using Binary Saerch how many iterations are required?
Option A:	2
Option B:	3
Option C:	4
Option D:	5
14.	If the elements “80”, “10”, “90” and “10” are placed in a queue and are deleted one at a time, in what order will they be removed?
Option A:	80,10,90,10
Option B:	10,90,10,80
Option C:	80,10,10,90
Option D:	10,90,80,10
15.	The preorder traversal of a binary search tree is 18,9,8,17,13,21,25,24,33 Which one of the following is the postorder traversal of the tree?
Option A:	8,13,17,9,33,24,25,21,18
Option B:	8,17,13,9,24,33,25,21,18
Option C:	8,13,17,9,24,33,25,21,18
Option D:	8,13,17,9,24,33,21,25,18
16.	 What is output sequence of in_order traversal of Binary Tree?
Option A:	1,3,4,6,7,8,10,14,13
Option B:	1,3,4,6,8,7,10,13,14
Option C:	1,3,4,6,7,8,10,13,14
Option D:	1,3,4,7,6,8,10,13,14
17.	Which of the following traversing algorithm is applied to Binary Search tree to get sorted list?
Option A:	Post order
Option B:	Pre order
Option C:	Randomized
Option D:	In order
18.	What formula can be used to locate a right child in Binary Tree, if the node has an index i?
Option A:	2i+1
Option B:	2i+2
Option C:	2i

Option D:	4i
19.	Which of the following algorithm is not under Divide and Conquer strategy?
Option A:	Merge Sort
Option B:	Binary Search
Option C:	Bubble Sort
Option D:	Quick Sort
20.	Which of the following algorithm is very efficient for sorting?
Option A:	Quick Sort
Option B:	Bubble Sort
Option C:	Insertion Sort
Option D:	Selection Sort

Q2 **(20 Marks)**	**Solve any Two Questions out of Three** **10 marks each**
A	Write a program in 'C' program to implement Binary Search on ascending order roll number of students.
B	Write a short note on Expression Tree with example.
C	Write a menu driven program in 'C' to perform Insertion, Deletion, Display and Count number of nodes on single linked list.

Q3 **(20 Marks)**	**Solve any Two Questions out of Three** **10 marks each**
A	Write a program in 'C' to convert infix expression to postfix expression having (+, -, *, /) operators written between the operands using STACK.
B	What is graph? Explain different representation of graph with example.
C	Write a program in 'C' to implement Circular Queue using array.

University of Mumbai

Examination 2020 under cluster __ (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: Rev2012

Examination: SE Semester III

Course Code:CSC303 and Course Name: Data Structures

Time: 2 hour Max. Marks: 80

==========

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

2	**Solve any Two Questions out of Three**

A	#include<stdio.h>
	
	int main()
	{
	
	int a[100],n,key,low,mid,high,i,chk=0;
	
	printf("How Many Students:\n");
	scanf("%d",&n);
	
	for(i=0;i<n;i++)
	
	{
	
	printf("Enter roll numbers in ascending order. %d:\n",(i+1));
	scanf("%d",&a[i]);
	}
	
	printf("Enter The roll number To Be Searched:\n");
	scanf("%d",&key);
	low=0;
	high=n-1;
	
	while(low<=high)
	{
	
	mid=(low+high)/2;
	if(a[mid]==key)
	{
	
	printf("Value Found At Position %d\n",(mid+1));
	chk=1;
	break;
	
	}
	
	if(a[mid]>key)
	high=mid-1;
	else
	low=mid+1;
	}
	
	if(chk==0)
	
	printf("Value Not Found\n");

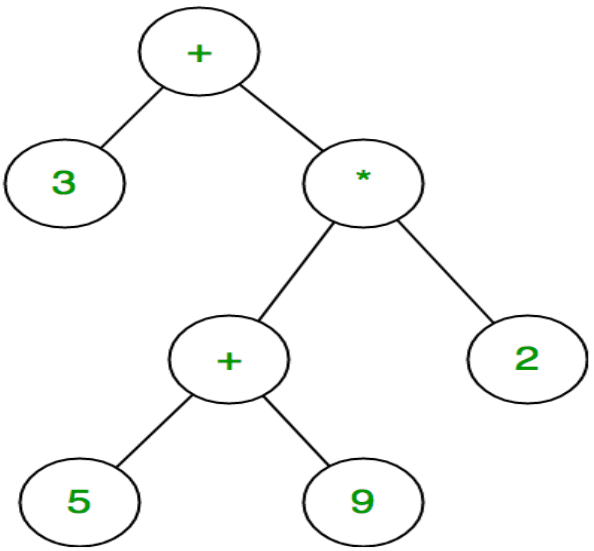
return 0;
}

B

Expression Tree

Expression tree is a binary tree in which each internal node corresponds to operator and each leaf node corresponds to operand so for example expression tree for

3 + ((5+9)*2) would be:



Inorder traversal of expression tree produces infix version of given postfix expression (same with preorder traversal it gives prefix expression)

Construction of Expression Tree:
Now For constructing expression tree we use a stack. We loop through input expression and do following for every character.
1) If character is operand push that into stack
2) If character is operator pop two values from stack make them its child and push current node again.
At the end only element of stack will be root of expression tree.

C

```
#include<stdio.h>

#include<stdlib.h>

struct node
{

int data;
struct node *link;
};

struct node *p;

void append(struct node *q,int num)
{
```

```
struct node *temp,*r;

    if(q==NULL)
     {
      printf("Creating List\n");
      temp=(struct node *)malloc(sizeof(struct node));
      temp->data=num;
      temp->link=NULL;
      p=temp;
      q=temp;

     }
    else
    {
      r=q;
      while(r->link!=NULL)
      r=r->link;

      temp=(struct node *)malloc(sizeof(struct node));
      temp->data=num;
       temp->link=NULL;
       r->link=temp;
    }
}

void inbegin(struct node *q,int num)
{

  struct node *temp;
  if(q==NULL)
      printf("Link List Does Not Exists\n");
 else
  {
    temp=(struct node *)malloc(sizeof(struct node));
    temp->data=num;
    temp->link=p;
    p=temp;
   }
}

void delet(struct node *q,int num)
{
   struct node *prev,*curr;
   int found=0;
   prev=NULL;

   if(q==NULL)
     printf("list does not exist");

  else
  {
    for(curr=q;curr!=NULL;prev=curr,curr=curr->link)
    {
    if(curr->data==num)
          {
            if(prev==NULL)
               {
                    p=curr->link;
```

```
                    found=1;
                }

             else
                  {
                      prev->link=curr->link;
                      found=1;
                   }
            }
    }

    if(found==1)
        printf("no deleted");

    else
            printf("not found");

}

}

void count(struct node *q)
{

int c; c=0;
if(q==NULL)
printf("Link List Does Not Exists");
else
{

while(q!=NULL)
{

c++;
q=q->link;
}

printf("Number Of Nodes %d\n",c);
}

}


void display(struct node *q)
{

if(q==NULL)
printf("Link List Does Not Exists\n");
else
{

printf("Contents:\n");
while(q!=NULL)
{

printf("%d\n" ,q->data);
q=q->link;
}
```

```
}
}

int main()
{

int n,c; p=NULL;

do
{

printf("Enter Your Choice:\n");
printf("1.Create\\Append\t");

printf("\t2.Begin\t");
printf("\t3.Delete\t"); printf("\t4.Count\t");
printf("\t5.Display\t");
printf("\t6.Exit\n");
scanf("%d",&c);
switch(c)
{

case 1:
printf("Enter A Value:\n");
scanf("%d",&n); append(p,n);
break;
case 2:
printf("Enter A Value:\n");
scanf("%d",&n);
inbegin(p,n);
break;
case 3:
printf("Enter A Value:\n");
scanf("%d",&n);
delet(p,n);
break;
case 4:

count(p);
break;
case 5: display(p);
break;
}
}
while(c!=6);
return 0;

}
```

3	**Solve any Two Questions out of Three**

A	`#include<stdio.h>`
	
	`#include<string.h>`
	`int isoperand(char n)`
	`{`
	`if((n>='a' && n<='z')||(n>='A'&& n<='Z') || (n>=0 && n<=9))`

```
          return 1;
        else
         return 0;
 }


int priority(char n)
{      if(n=='*' || n=='/')
            return 2;
       else if(n=='+' || n=='-')
            return 1;
        else
              return 0;
 }

 int main()
   { int j=-1,i,top=-1;
     char infix[20],postfix[20],stack[20];

printf("Enter Infix:\n ");
gets(infix);
for(i=0;infix[i]!='\0';i++)
 { if(infix[i]=='(')
          { top++;
                stack[top]=infix[i];
           }
   else if(isoperand(infix[i])==1)
          { j=j+1;
           postfix[j]=infix[i];
         }
   else if(top==-1)
         {
           top=top+1;
            stack[top]=infix[i];
         }
   else if(infix[i]==')')
         { while(stack[top]!='(')
            { j=j+1;
             postfix[j]=stack[top];
              top=top-1;
         }
         top=top-1;
       }
else if(priority(infix[i])>priority(stack[top]))
              { top=top+1;
              stack[top]=infix[i];
               }
else if(priority(infix[i])<priority(stack[top]))
 { while(priority(stack[top])>=priority(infix[i]) && top!=-1 &&
stack[top]!='(')
      { j=j+1;
        postfix[j]=stack[top];
        top=top-1;
      }
     top=top+1;
      stack[top]=infix[i];
      }
}
```

```
while(top!=-1)
{ j=j+1;
postfix[j]=stack[top];
 top=top-1;
 }
postfix[j+1]='\0';

puts(postfix);
return 0;
}
```

B

A Graph is a non-linear data structure consisting of nodes and edges. The nodes are sometimes also referred to as vertices and the edges are lines or arcs that connect any two nodes in the graph.

Graph Representations

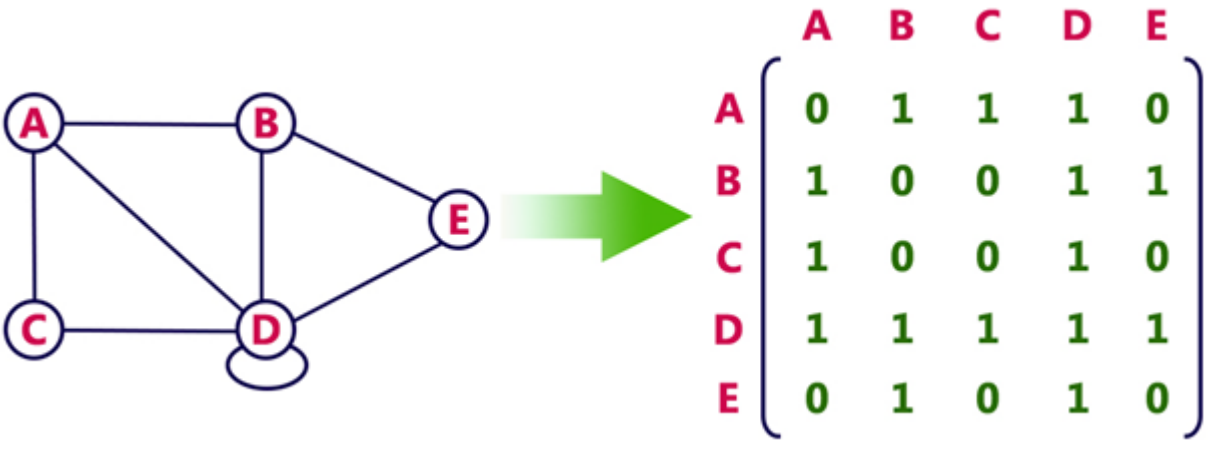
1. Adjacency Matrix

- Adjacency matrix is a sequential representation.
- It is used to represent which nodes are adjacent to each other. i.e. is there any edge connecting nodes to a graph.
- In this representation, we have to construct a nXn matrix A. If there is any edge from a vertex i to vertex j, then the corresponding element of A, $a^{i,j} = 1$, otherwise $a^{i,j} = 0$.
- If there is any weighted graph then instead of 1s and 0s, we can store the weight of the edge.

Example

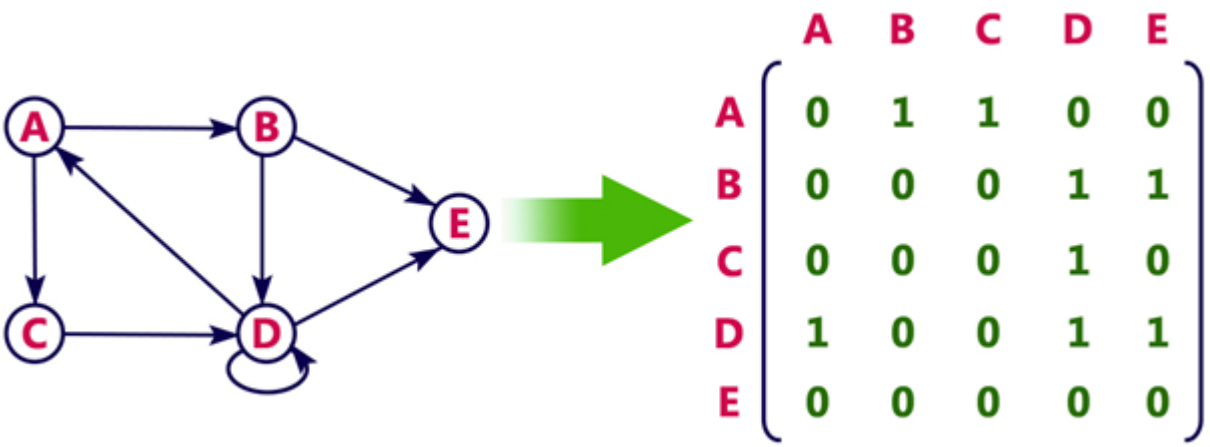
Consider the following **undirected graph representation**:

Undirected graph representation



Directed graph represenation

See the directed graph representation:



In the above examples, 1 represents an edge from row vertex to column vertex, and 0 represents no edge from row vertex to column vertex.

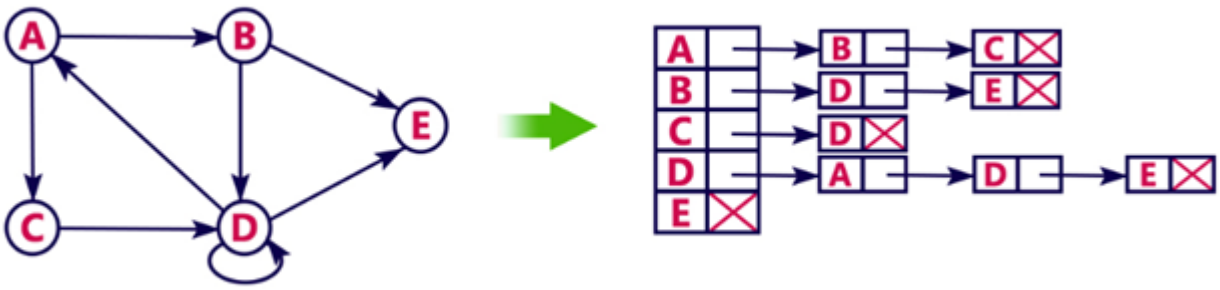
Undirected weighted graph representation

2.Adjacency List

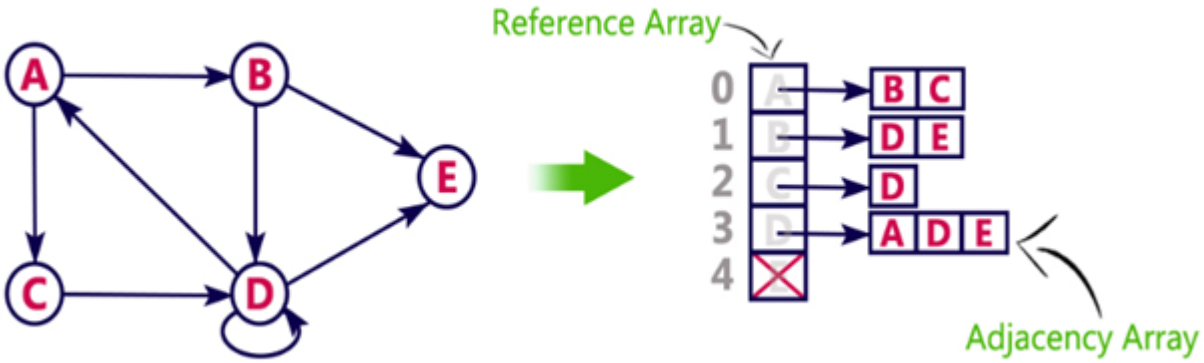
- Adjacency list is a linked representation.
- In this representation, for each vertex in the graph, we maintain the list of its neighbors. It means, every vertex of the graph contains list of its adjacent vertices.
- We have an array of vertices which is indexed by the vertex number and for each vertex v, the corresponding array element points to a **singly linked list** of neighbors of v.

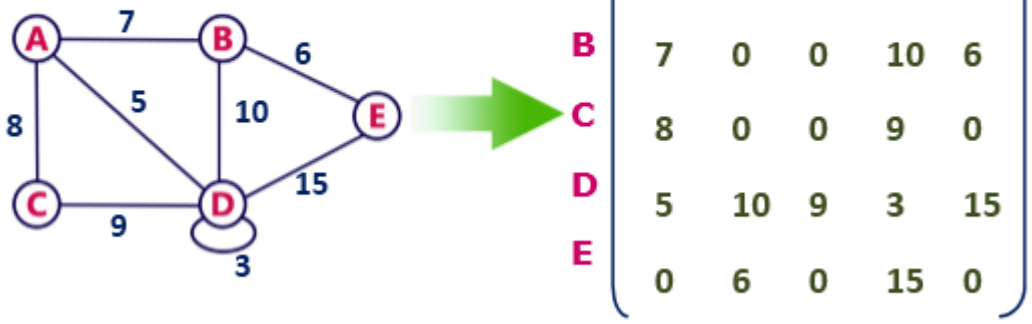
Example

Let's see the following directed graph representation implemented using linked list:



We can also implement this representation using array as follows:





C

```
#include<stdio.h>
#inlcude<conio.h>

# define size 5
int queue [size];
int f=-1;
int r=-1;

int empty()
{

if(f==-1)
  return 1;
else
  return 0;
}

int full()
{

if((f==0)&&(r==(size-1))||(f==r+1))
    return 1;
```

```
else
   return 0;
}

void insert(int x)
{

if(full()==1)
 printf("Circular Queue Overflow\n");
else if((f==-1)&&(r==-1))
{

f=r=0;
queue[r]=x;
}

else if((r==(size-1))&&(f!=0))
{

 r=0;
queue[r]=x;


}

else
{

r++;
queue[r]=x;


}
}

void delete()
{

if(empty()==1)
printf("Circular Queue Empty\n");

else if(f==r)
f=r=-1;
else if(f==(size-1))
     f=0;
else
  f++;
}

void display()
```

```
{

int i;
if(empty()==1)
printf("Circular Queue Empty\n");

else if(f<=r)
{

printf("Contents:\n");
for(i=f;i<=r;i++)
{

printf("%d\n",queue[i]);
}
}

else if(f>r)
{

printf("Contents:\n");
for(i=f;i<=(size-1);i++)
{

printf("%d\n",queue[i]);
}

for(i=0;i<=r;i++)
{

printf("%d\n",queue[i]);
}
}
}

int main()
{

int x,c;

 do
{

printf("Enter Your Choice:\n");
printf("1.Insert\n");
printf("2.Delete\n");
printf("3.Display\n");
printf("4.Exit\n");
scanf("%d",&c);
switch(c)
```

```
{

case 1:
        printf("Enter A Element:\n");
          scanf("%d",&x);
          insert(x);

           break;
 case 2: delete();
          break;
case 3: display();
 break;
}
}

while(c!=4);
return 0;
}
```

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: **Rev 2012**

Examination: **SE** Semester **III**

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

Time: 2 hour Max. Marks: 80

==========

1501_R12_Comp_III_CSC304_QP2

==========

=

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	A number system with a base of 16 is called as _____ number system
Option A:	Decimal
Option B:	Binary
Option C:	Octal
Option D:	Hexadecimal
2.	Binary equivalent of Octal number 2020 will be_____
Option A:	010100101001
Option B:	010000010000
Option C:	011000100000
Option D:	010010010000
3.	In BCD addition is added to the result if answer is invalid BCD
Option A:	$(1010)_2$
Option B:	$(1100)_2$
Option C:	$(1001)_2$
Option D:	$(0110)_2$
4.	BAD in hexadecimal number system will be in binary number system
Option A:	110110101101
Option B:	101111001011
Option C:	101110101101
Option D:	101010111101
5.	When one or more inputs are zero_____ gate will produce a LOW output.
Option A:	OR gate
Option B:	NOT gate
Option C:	AND gate
Option D:	NOR gate
6.	_____are Universal Gates
Option A:	OR, AND
Option B:	XOR, AND

Option C:	NAND, NOR
Option D:	XOR,OR
7.	gate is also known as inequality comparator gate.
Option A:	NAND
Option B:	NOR
Option C:	EX-OR
Option D:	EX-NOR
8.	Using Boolean algebraic laws, A'B'C+AB'C+BC can be simplified as_____
Option A:	C
Option B:	B
Option C:	B'
Option D:	1
9.	The simplification of given function Y = ∑m (1,3,5,7) will be
Option A:	A'C
Option B:	C
Option C:	A'C+AC'
Option D:	A
10.	1:256 De-multiplexer will need number of select lines
Option A:	4
Option B:	5
Option C:	8
Option D:	10
11.	_____ number of 4:1 multiplexer's will be needed to implement a 8:1 Multiplexer.
Option A:	2
Option B:	3
Option C:	4
Option D:	1
12.	Strobe pin in a multiplexer/demultiplexer IC provides_____
Option A:	VCC
Option B:	Ground
Option C:	Selection of inputs.
Option D:	Chip Activation
13.	In a combinational logic circuit, output depends on
Option A:	Present values of input
Option B:	Trigger input signal
Option C:	Voltage value
Option D:	Past values of input
14.	If J =K =1 the condition is
Option A:	Forbidden condition

Option B:	Race around condition
Option C:	Toggle state
Option D:	Past state
15.	Shift registers are generally designed using _____ type of FF's
Option A:	SR FF
Option B:	JK FF
Option C:	T FF
Option D:	D FF
16.	counter uses previous Flip Flop to trigger the next Flip Flop
Option A:	serial
Option B:	parallel
Option C:	asynchronous
Option D:	synchronous
17.	Asynchronous counter is also known as
Option A:	Ripple counter
Option B:	Johnson's counter
Option C:	SSI counter
Option D:	Twisted Ring Counter
18.	____ number of Flip flop's will be required to implement MOD 8 asynchronous counter
Option A:	3
Option B:	5
Option C:	7
Option D:	8
19.	Figure of merit defines _____.
Option A:	speed of operation
Option B:	Product of propagation time and power dissipation
Option C:	package density
Option D:	noise margin
20.	For four input AND, Fan In will be _____.
Option A:	1
Option B:	2
Option C:	3
Option D:	4

Q2	**20 Marks**
A	**Solve any Two** **(05 marks each)**
i.	If a 7 bit hamming code word received by a receiver is 1011011 , assuming even parity, state whether the received code word is correct or not ? If not, locate the bit in error
ii.	Simplify using K-map and realize using NOR gates. $F(A,B,C,D) = \sum m(1,3,7,11,15) + d(0,2,5,8,14)$

iii.	Explain Master slave JK flipflop.
B	**Solve any One** **(10 marks each)**
i.	Design a 2 bit magnitude comparator.
ii.	Realize 32:1 MUX using 8:1 MUX.

Q3	**20 Marks**
A	**Solve any Two** **(05 marks each)**
i.	Implement a MOD 8 asynchronous UP counter
ii.	Compare different Logic families based on fan in, fan out and propagation delay.
iii.	Write note on ALU
B	**Solve any One** **(10 marks each)**
i.	Design Mod 6 synchronous counter using JK flip flop.
ii.	Implement BCD adder using IC 7483

University of Mumbai

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

Program: **Computer Engineering**

Curriculum Scheme: **Rev 2012**

Examination: **SE** Semester **III**

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

Time: 2 hour Max. Marks: 80

==========

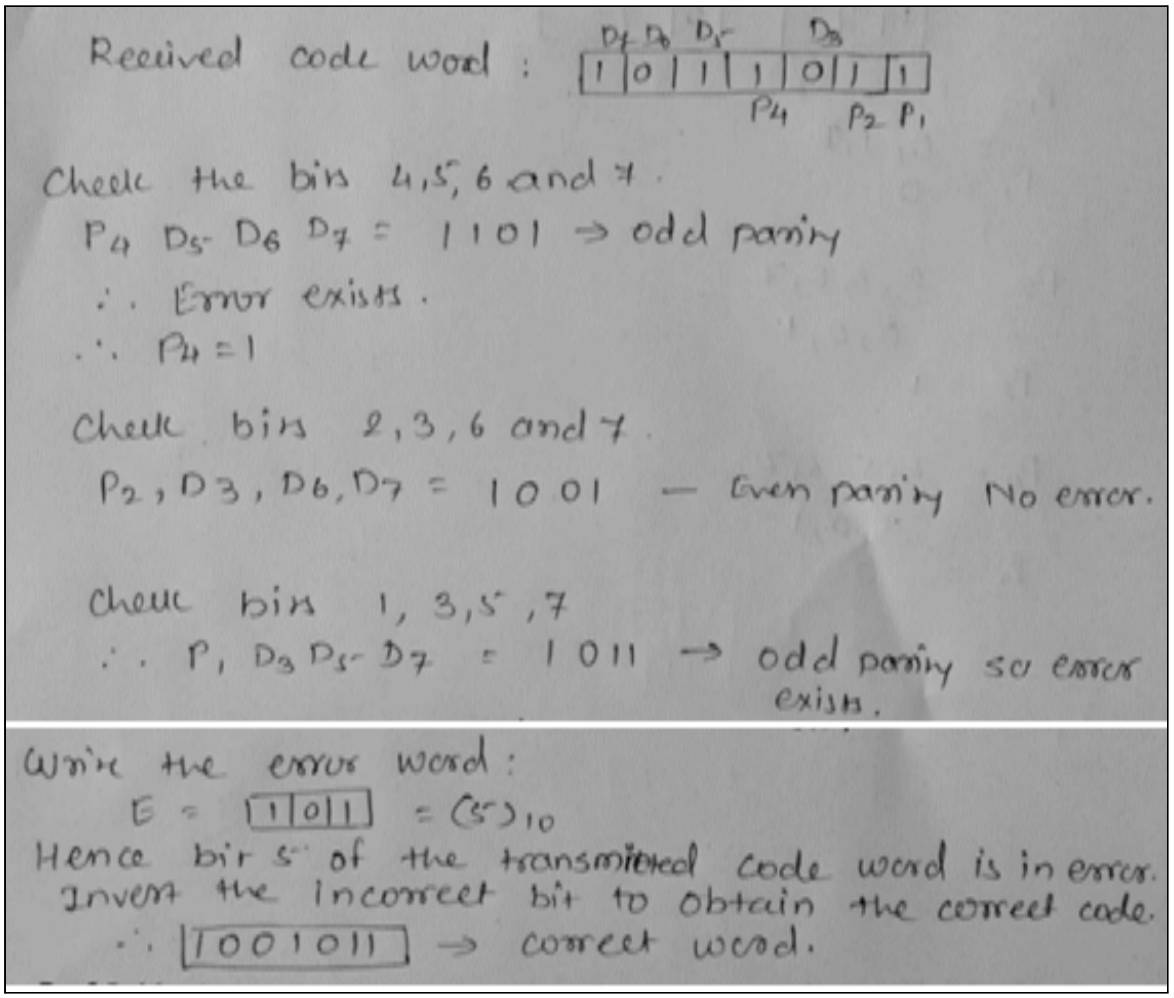
1501_R12_Comp_III_CSC304_AK2

==========

=

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

Q.2 A (i)


Received code word :
D7 D6 D5 D3
1 0 1 1 0 1 1
P4 P2 P1
Check the bits 4, 5, 6 and 7.
P4 D5 D6 D7 = 1101 → odd parity
∴ Error exists.
∴ P4 = 1
Check bits 2, 3, 6 and 7.
P2, D3, D6, D7 = 1001 — Even parity No error.
Check bits 1, 3, 5, 7
∴ P1 D3 D5 D7 = 1011 → odd parity so error exists.
Write the error word :
E = 1 0 1 = (5)10
Hence bit 5 of the transmitted code word is in error.
Invert the incorrect bit to obtain the correct code.
∴ 1001011 → correct word.

Q.2 A (ii)

Page No.
Date

Q.2. A (ii) Simplify Using K-Map and realize Using NOR

$F(A,B,C,D) = \Sigma m(1,3,7,11,15) + d(0,2,5,8,14)$

Soln :-

AB \ CD	00	01	11	10
00	X_0	1 (1)	1 (3)	X_2
01	0_4	X_5	1 (7)	0_6
11	0_{12}	0_{13}	1 (15)	X_{14}
10	X_8	0_9	1 (11)	0_{10}

$\bar{A}\bar{B}$

CD

$y = \bar{A}\bar{B} + CD$

To realize the fun^c Using NOR, convert SOP form to POS form by applying De-Morgan's.

$y = \overline{\bar{A}\bar{B} + CD}$

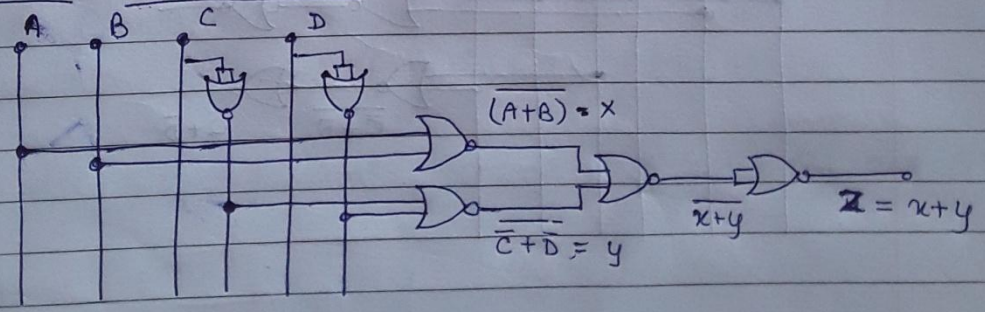
$\therefore y = \overline{\bar{A}\bar{B}} \cdot \overline{CD}$ $\quad \because \overline{x+y} = \bar{x}\cdot\bar{y}$

$= (\bar{\bar{A}} + \bar{\bar{B}}) \cdot (\bar{C} + \bar{D})$

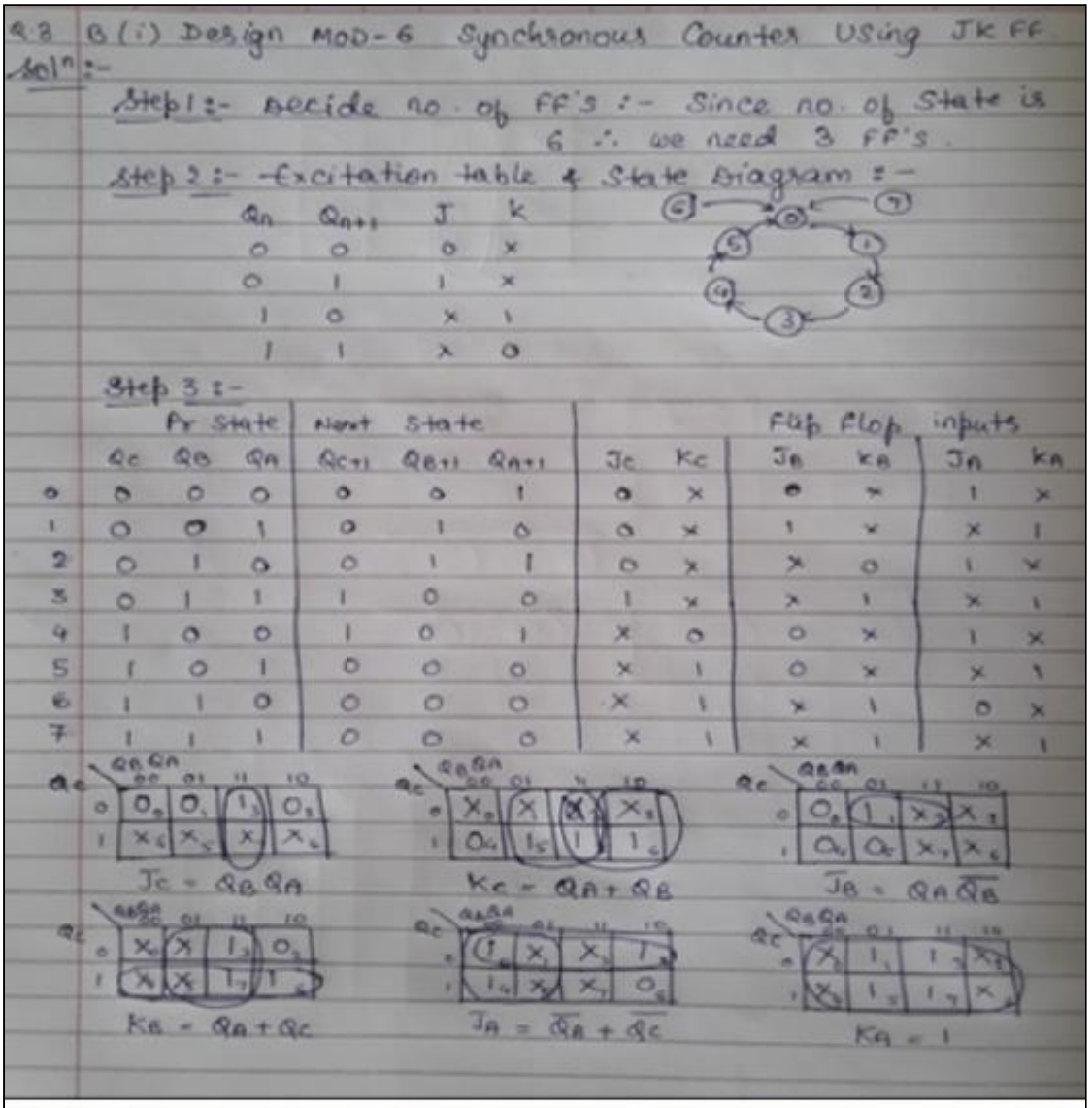
$= (A+B)(\bar{C}+\bar{D})$

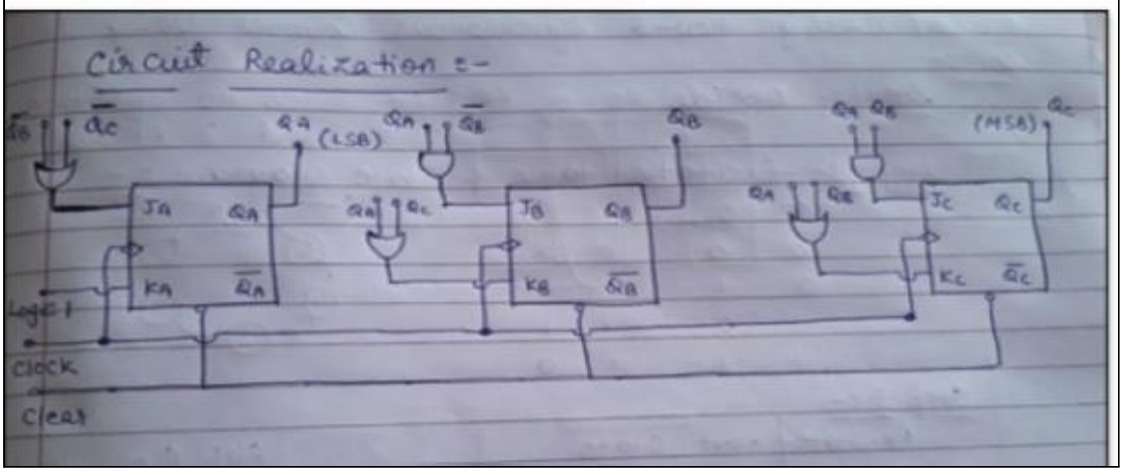
$= \boxed{\overline{(A+B)} + \overline{(\bar{C}+\bar{D})}}$ $\quad \because \overline{x\cdot y} = \bar{x} + \bar{y}$

Circuit Realization :-



Q. 3 B (i)


Q.3 B (i) Design MOD-6 Synchronous Counter Using JK FF
Soln :-
Step 1 :- Decide no. of FF's :- Since no. of State is 6 ∴ we need 3 FF's.
Step 2 :- Excitation table & State Diagram :-
Qn Qn+1 J K
0 0 0 x
0 1 1 x
1 0 x 1
1 1 x 0
Step 3 :-
Pr State Next State Flip Flop inputs
Qc QB QA Qc+1 QB+1 QA+1 Jc Kc JB KB JA KA
Jc = QB QA
Kc = QA + QB
JB = QA $\overline{Q_B}$
KB = QA + Qc
JA = $\overline{Q_B}$ + $\overline{Q_c}$
KA = 1


Circuit Realization :-
Qc
QA (LSB)
QB
(MSB)
JA QA
KA $\overline{Q_A}$
JB QB
KB $\overline{Q_B}$
Jc Qc
Kc $\overline{Q_c}$
Logic 1
Clock
Clear

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

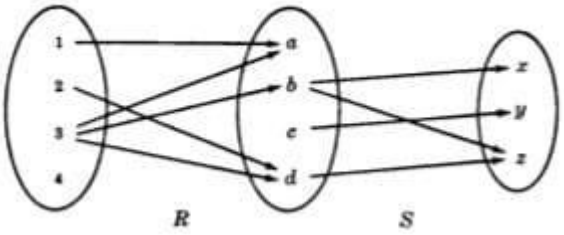
Examination: SE Semester III

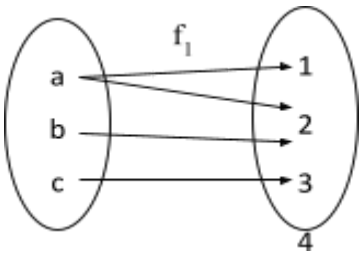
Course Code: CSC305 and Course Name: Discrete Structure

Time: 2 hour Max. Marks: 80

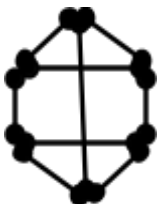
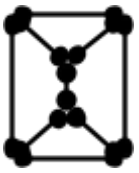
==========

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

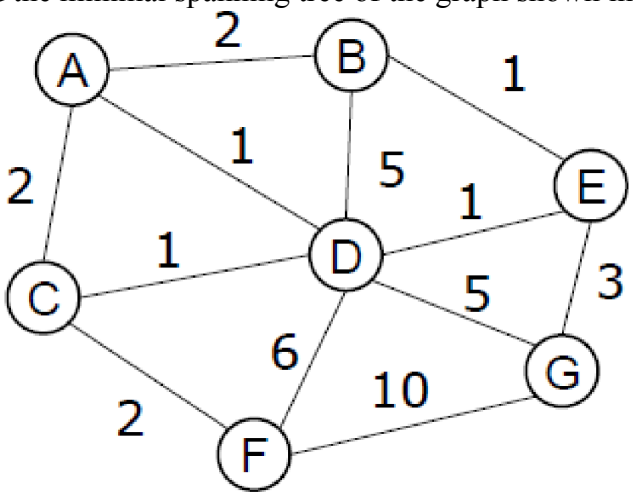
Option C:	$B \neq C$
Option D:	$B \subseteq C$
6.	$M_R=[1\ 1\ 0\ 1\ 0\ 1\ 0\ 0\ 1\ 0\ 0\ 1\ 0\ 0\ 0\ 1]$
Option A:	Matrix M_R is reflexive
Option B:	Matrix M_R is irreflexive
Option C:	Matrix M_R is symmetric
Option D:	Matrix M_R neither reflexive not irreflexive
7.	Let A={1,2,3} and R={(1,1),(1,2),(3,1),(3,3)} 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= [1 0 0 1 1 0 0 1 1 1 0 0 0 1 0 0 0 1] 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 $\sim (p \wedge q) \rightarrow (\sim p \vee (\sim p \vee q))$
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.

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

==========

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

Q 2

A) $n(S) = 500$

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

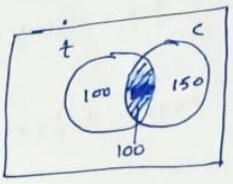
$n(c) = 50\%$ of $500 = 250$

$n(t \cap c) = 20\%$ 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 coffee $= 250 - 100$
$= 150$

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

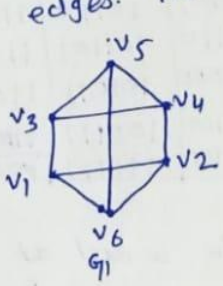
$a_n = 7 \cdot 1^n - 2^n$

$a_n = 7 - 2^n$

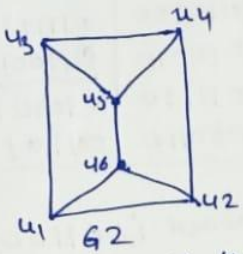
— x —

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

$e(000) = 000\,x_1x_2x_3$
$x_1 = 0.1 + 0.1 + 0.0 = 0$
$x_2 = 0.0 + 0.1 + 0.1 = 0$
$x_3 = 0.0 + 0.0 + 0.1 = 0$

∴ $e(000) = 000000$
$e(001) = 001011$
$e(010) = 010110$
$e(011) = 011101$
$e(100) = 100100$
$e(101) = 101111$
$e(110) = 110010$
$e(111) = 111001$

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 $e(111) = 111001$

$\therefore d(101001) = 111$

iii) The received word is. 111010.

The word at the top is 110010.

since $e(110) = 110010$

$\therefore d(111010) = 110$

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 in

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

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

— 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

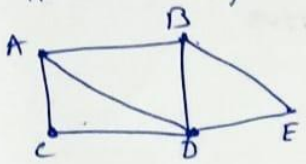
$$\left\lceil \frac{61327 - 1}{30} \right\rceil + 1 = 2044 + 1 = 2045$$

∴ Atleast one dictionary will have 2045 pages.

Q3.

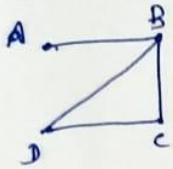
D) Eular path - A path in a graph is called Eular path if it includes all edges but each edge exactly ones & vertex may be repeated.

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)

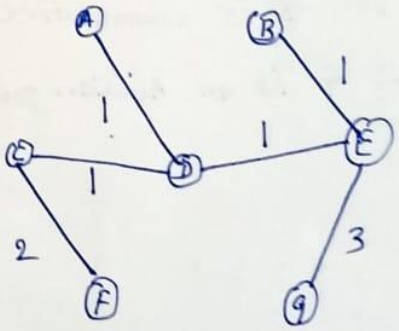
2 : (A, B), (C, F), (A, C)

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

G1: From the table ⊛ is associative

$2 \circledast (3 \circledast 4) = 2 \circledast 2 = 4$

$(2 \circledast 3) \circledast 4 = 1 \circledast 4 = 4$

G2: First row & first col^{n} show that 1 is identity element for ⊛

G3: Inverse exist for element

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

G4: Further

$a \circledast b = b \circledast a$

$2 \circledast 4 = 4 \circledast 2$

$3 = 3$

i.e. ⊛ is commutative

∴ G is an Abelian group.

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: 2 hour Max. Marks: 80

==========

Q.1	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The biasing of gate of a JFET is
Option A:	Forward
Option B:	Reversed
Option C:	Tristated
Option D:	Both forward and reversed
2.	In an LC oscillator, the frequency of oscillator is ---------- L or C
Option A:	Proportional to square of
Option B:	Directly proportional to
Option C:	Independent of the values of
Option D:	Inversely proportional to square root of
3.	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
4.	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
5.	For an OP-AMP with negative feedback, the output is
Option A:	Equal to the input
Option B:	Increased
Option C:	Feedback to Inverting input
Option D:	Feedback to Non-Inverting input
6.	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

7.	The line connecting positive and negative peaks of the carrier waveform is called as
Option A:	Peak line
Option B:	Envelope
Option C:	Maximum amplitude ceiling
Option D:	Modulation index
8.	The circuit used for producing AM called?
Option A:	Transmitter
Option B:	Modulator
Option C:	Receiver
Option D:	Duplexer
9.	In the spectrum of a frequency-modulated wave
Option A:	The carrier frequency disappears when the modulation index is large
Option B:	The amplitude of any sideband depends on the modulation index
Option C:	The total number of sidebands depends on the modulation index
Option D:	The carrier frequency cannot disappear
10.	The difference between phase and frequency modulation
Option A:	Is purely theoretical because they are the same in practice
Option B:	Is too great to make the two system compatible
Option C:	Lies in the poorer audio response of phase modulation
Option D:	Lies in the different definitions of the modulation index
11.	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
12.	When the modulating frequency is doubled, the modulation index is halved, and the modulating voltage remains constant. The modulation system is
Option A:	Amplitude modulation
Option B:	Phase modulation
Option C:	Frequency modulation
Option D:	Pulse Modulation
13.	The output voltage of phase detector is
Option A:	Phase voltage
Option B:	Free running voltage
Option C:	Error voltage

Option D:	Lock voltage
14.	Which of the following is a digital modulation technique?
Option A:	PCM
Option B:	PSK
Option C:	DM
Option D:	PAMs
15.	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
16.	What is the function of low pass filter in phase-locked loop ?
Option A:	Improves low frequency noise
Option B:	Removes high frequency noise
Option C:	Tracks the voltage changes
Option D:	Changes the input frequency
17.	Find the Nyquist rate and Nyquist interval for the signal f(t) = 1 + sinc300πt.
Option A:	300 Hz, 3 msec
Option B:	300 Hz, 3.3 msec
Option C:	30 Hz, 3 msec
Option D:	3 Hz, 3 msec
18.	Determine the Nyquist rate of the signal x (t) = 1 + cos 1000πt + sin 2000πt.
Option A:	1000 Hz
Option B:	2000 Hz
Option C:	3000 Hz
Option D:	2 Hz
19.	Delta modulation is conversion.
Option A:	Analog to digital
Option B:	Digital to analog
Option C:	Analog to digital and digital to analog
Option D:	digital to analog and Analog to digital
20.	Source of noise in delta modulation is
Option A:	Granularity
Option B:	Slope overload
Option C:	Granularity & Slope overload
Option D:	Slop under load

Subjective / Descriptive questions

Q2	**Solve any Two Questions out of Three**	**10 marks each**
A	Describe concept of amplitude modulation (AM) & define modulation index (m_a).	
B	Explain the method of direct FM generation with an example.	
C	Discuss the operation of adaptive delta modulation (ADM) with neat block diagram.	
Q3.	**Solve any Two Questions out of Three**	**10 marks each**
A	Explain transfer & V-I characteristics of junction field effect transistor (JFET).	
B	Derive the expression for output voltage for operational amplifier based differentiator.	
C	Derive expression of output voltage for difference amplifier with neat circuit diagram.	

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: 2 hour Max. Marks: 80

==========

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