University of Mumbai

Examination 2021 under cluster __ (Lead College: _________)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: **BE (Computer Engineering)**

Curriculum Scheme: Rev 2016 (CBCGS)

Examination: SE Semester III

Course Code: CSC301 and Course Name: APPLIED MATHEMATICS - III

Time: 2 hours 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.	Find the value of b_n in the half range cosine series expansion of $f(x) = e^x, 0 < x < 1$
Option A:	$b_n = e^2 - 1$
Option B:	$b_n = e - 1$
Option C:	$b_n = 0$
Option D:	$b_n = e + 1$
2.	Find the fixed points of $\frac{2z+6}{z+7}$
Option A:	6,1
Option B:	-6,1
Option C:	6,-1
Option D:	-6,-1
3.	Find inverse Laplace Transform of $\frac{1}{s\,(s^2+4)}$
Option A:	$\frac{1}{4}(1-\cos 2t)$
Option B:	$\frac{1}{2}(1-\cos t)$
Option C:	$\frac{1}{4}(1-\cos t)$
Option D:	$\frac{1}{4}(1+\cos 2t)$
4.	Calculate the Rank correlation coefficient from the following data of the ranks of the students in Maths and Physics Rank in Maths: 1, 2, 3, 4, 5, 6, 7, 8 Rank in Physics: 2, 4, 1, 5, 3, 8, 7, 6
Option A:	0.79
Option B:	0.86
Option C:	0.74
Option D:	0.67

Rank in Maths	1	2	3	4	5	6	7	8
Rank in Physics	2	4	1	5	3	8	7	6

5.	Find the Inverse Laplace transform of $\frac{3(s^2-1)^2}{2s^5}$
Option A:	$\frac{3}{2}-\frac{3}{2}t^2+\frac{1}{16}t^4$
Option B:	$\frac{3}{2}-\frac{3}{2}t^2-\frac{1}{16}t^4$
Option C:	$-\frac{3}{2}+\frac{3}{2}t^3+\frac{1}{16}t^4$
Option D:	$\frac{3}{2}-\frac{3}{2}t^3+\frac{1}{16}t^4$
6.	If two variables oppose each other then the correlation will be
Option A:	Positive Correlation
Option B:	Zero Correlation
Option C:	Perfect Correlation
Option D:	Negative Correlation
7.	Find the Inverse Laplace transform of $\frac{2s^2-4}{(s+1)\,(s-2)\,(s-3)}$
Option A:	$-\frac{1}{6}e^{-t}-\frac{4}{3}e^{2t}-\frac{7}{2}e^{3t}$
Option B:	$-\frac{1}{6}e^{-t}-\frac{4}{3}e^{2t}+\frac{7}{2}e^{3t}$
Option C:	$-\frac{1}{6}e^{t}-\frac{4}{3}e^{-2t}+\frac{7}{2}e^{-3t}$
Option D:	$-\frac{1}{6}e^{-t}+\frac{4}{3}e^{2t}+\frac{7}{2}e^{3t}$
8.	Evaluate $\int_0^{\infty} e^{-5t}\delta(t-3)\,dt$
Option A:	e^{-s}
Option B:	1
Option C:	e^{-15s}
Option D:	e^{15s}
9.	Z transform of $u(k)=\begin{cases}1, k\geq 0\\ 0, k<0\end{cases}$ is
Option A:	$\frac{z}{1-z}$
Option B:	$\frac{z}{z-1}$
Option C:	$\frac{z}{z+1}$
Option D:	1
10.	In the Fourier series expansion of $f(x)=e^{\alpha x}, \alpha\neq 0$ in $(0,2\pi)$ what is the value of b_5
Option A:	$\frac{5(1-e^{-2\pi\alpha})}{\pi(\alpha^2+25)}$
Option B:	$\frac{5(1+e^{2\pi\alpha})}{\pi(\alpha^2+25)}$
Option C:	$\frac{5(1-e^{2\pi\alpha})}{\pi(\alpha^2+25)}$

Option D:	$\frac{(1-e^{-2\pi\alpha})}{5\pi(\alpha^2+25)}$
11.	Find $L(t\, e^{3t} \sin 4t)$
Option A:	$\frac{2(s-3)}{(s^2-6s+25)^2}$
Option B:	$\frac{4(s-3)}{(s^2-6s+25)^2}$
Option C:	$\frac{8(s-3)}{(s^2-6s+25)^2}$
Option D:	$\frac{8(s-3)}{(s^2-6s+25)}$
12.	In the expansion of $f(x) = x(\pi - x)$ as a series of cosines of multiples of x in $0 < x < \pi$ what will be the value of a_0
Option A:	$a_0 = 0$
Option B:	$a_0 = \frac{\pi^2}{6}$
Option C:	$a_0 = -2\left(\frac{1+\cos n\pi}{n^2}\right)$
Option D:	$a_0 = \frac{\pi^2}{12}$
13.	The inverse Z- transform of F(z)= $\frac{1}{z+a}$ is
Option A:	$\{(-a)^{1-k}\}, \lvert z\rvert > a, k \geq 1$
Option B:	$\{(a)^{k-1}\}, \lvert z\rvert > a, k \geq 1$
Option C:	$\{(-a)^{k+1}\}, \lvert z\rvert > a, k \geq 1$
Option D:	$\{(-a)^{k-1}\}, \lvert z\rvert > a, k \geq 1$
14.	Coefficients of regression are
Option A:	Independent of change of origin and change of scale
Option B:	Independent of change of scale but not of change of origin.
Option C:	Independent of change of origin but not of change of scale.
Option D:	Dependent on both change of scale and on the change of origin.
15.	Inverse Laplace Transform of $\tan^{-1}\frac{1}{s}$ is
Option A:	$\frac{1}{2t}\sin t$
Option B:	$\frac{1}{t}\sin 2t$
Option C:	$-\frac{1}{t}\sin 2t$
Option D:	$t \sin\frac{t}{2}$
16.	Find the mapping of the real axis of the z-plane under the transformation $w = \frac{2}{z+i}$
Option A:	A circle $\lvert w\rvert = 1$
Option B:	A circle centered at (0,-1) and radius 1
Option C:	A circle centered at (-1,0) and radius 1

Option D:	A circle centered at (1,1) and radius 1
17.	Find the Z transform of 5^k, $k \geq 0$
Option A:	$\frac{z}{z-5}$
Option B:	$\frac{z}{z+5}$
Option C:	$\frac{z}{5-z}$
Option D:	$\frac{z}{(z-5)^2}$
18.	Evaluate $L\left[\int_0^t e^t \frac{\sin t}{t} dt\right]$
Option A:	$\frac{1}{s}\cot^{-1}(s+1)$
Option B:	$\frac{1}{s^2}\cot^{-1}(s-1)$
Option C:	$\frac{1}{s^2}\cot^{-1}(s+1)$
Option D:	$\frac{1}{s}\cot^{-1}(s-1)$
19.	If $f(z) = u + iv$ is analytic then which of the following is false
Option A:	$f(z)$ satisfies CR equations
Option B:	u and v are harmonic functions
Option C:	$u_{xx} + u_{yy} = 0 \; and \; v_{xy} + v_{yy} = 0$
Option D:	$u \; and \; v$ are harmonic conjugates of each other
20.	Find $\int_0^\infty e^{-t} \, erf\sqrt{t} \, dt$
Option A:	$\sqrt{2}$
Option B:	$\frac{1}{\sqrt{2}}$
Option C:	$-\frac{1}{\sqrt{2}}$
Option D:	$\frac{1}{2}$

Q2	**Solve any Four out of Six** **5 marks each**
A	Evaluate inverse Laplace Transform of $\log\left(1+\frac{1}{s^2}\right)$.
B	Find $L(1+2t-3t^2+4t^3)\, H(t-2)$
C	Determine the constants a, b, c, d if $f(z) = x^2 + 2axy + by^2 + i(cx^2 + 2dxy + y^2)$ is analytic.
D	Find the Z-transform of $\left\{\left(\frac{1}{3}\right)^{\|k\|}\right\}$
E	Obtain the half range cosine series expansion of $f(x) = x(\pi - x), 0 < x < \pi$.
F	Calculate Speareman's coefficient of rank correlation from the following data of students

	Height (in inches.)	60	62	64	66	68	70	72	74
	Weight (in lbs.	92	83	101	110	128	119	137	146

Q3	**Solve any Four out of Six** **5 marks each**
A	Obtain the Fourier Series for $f(x) = 1 - x^2$ *in (-1, 1).*
B	Find an analytic function whose imaginary part is $\tan^{-1}\frac{y}{x}$.
C	Find the Laplace transform of $t\int_0^t e^{-2u}\ cos^2 u\ du.$
D	Find the inverse z transform of $Z^{-1}\left\{\frac{1}{z-1}\right\}$, $\lvert z\rvert < 1$.
E	Fit a straight line to the following data, with x as independent variable x: 1965, 1966, 1967, 1968, 1969 y: 125, 140, 1651, 195, 200
F	Using Laplace Transform solve $(D^2 - 3D + 2)y = 4e^{2t}$, with $y(0) = -3$ and $y'(0) = 5$.

Table for E:

x	1965	1966	1967	1968	1969
y	125	140	1651	195	200

University of Mumbai

Examination 2020 under cluster IV (Lead College: Pillai College of Engg)

Examinations Commencing from 15th June 2021 to 26th June2021

Program: **Computer**

Curriculum Scheme: Rev2016

Examination: SE Semester III

Course Code: **CSC302** and Course Name: **Digital Logic Design & Analysis**

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.	The octal number $(650.122)_8$ is equivalent to ______
Option A:	(1A9.2A)16
Option B:	(1B0.10)16
Option C:	(1A8.29)16
Option D:	(1B0.B0)16
2.	On subtracting $(001100)_2$ from $(101000)_2$ using 2's complement, we get _____
Option A:	1101100
Option B:	011100
Option C:	011101
Option D:	1101011
3.	The decimal number 15 is represented in its BCD form as __________
Option A:	10100000
Option B:	01010111
Option C:	00010101
Option D:	00101011
4.	According to Boolean law: A + A = ?
Option A:	1
Option B:	A
Option C:	0
Option D:	2A
5.	Assuming all numbers are in 2's complement representation, which of the following numbers is divisible by 11111011
Option A:	11100100
Option B:	11010111
Option C:	11011011

Option D:	11110110
6.	Which of the following expression does **not** equivalent to $\overline{X}$?
Option A:	X NAND X
Option B:	X NOR X
Option C:	X NAND 1
Option D:	X NOR 1
7.	A multiplexer with 2-bit data select input is a
Option A:	2: 1 Mux
Option B:	4:1 Mux
Option C:	8:1 Mux
Option D:	16:1 Mux
8.	There are _______ cells in a 5-variable K-map.
Option A:	2
Option B:	16
Option C:	32
Option D:	5
9.	Total number of inputs and Outputs in a full adder are ___________
Option A:	3,2
Option B:	2,3
Option C:	2,2
Option D:	3,1
10.	One that is not the outcome of magnitude comparator is _____________
Option A:	A>B
Option B:	A<B
Option C:	A=B
Option D:	A+B
11.	Number of essential prime Implicants required for the function F=Σ(2.4.6.7) are
Option A:	1
Option B:	2
Option C:	3
Option D:	4
12.	TTL 74LS85 is a ______________
Option A:	1-bit magnitude comparator
Option B:	4-bit magnitude comparator

Option C:	8-bit magnitude comparator
Option D:	16- bit magnitude comparator
13.	A basic S-R flip-flop can be constructed by cross-coupling of which basic logic gates?
Option A:	AND or OR gates
Option B:	XOR or XNOR gates
Option C:	NOR or NAND gates
Option D:	AND or NOR gates
14.	The logic circuits whose outputs at any instant of time depends only on the present input but not on the past outputs are called
Option A:	Combinational circuits
Option B:	Sequential circuits
Option C:	Latches
Option D:	Flip-flops
15.	On a negative edge-triggered S-R flip-flop, the outputs reflect the input condition when _________
Option A:	The clock pulse is LOW
Option B:	The clock pulse is HIGH
Option C:	The clock pulse transitions from LOW to HIGH
Option D:	The clock pulse transitions from HIGH to LOW
16.	Based on how binary information is entered or shifted out, shift registers are classified into ________ categories.
Option A:	1
Option B:	2
Option C:	3
Option D:	4
17.	Minimum number of Flip Flops required to design a modulo-200 ripple counter will be
Option A:	5
Option B:	6
Option C:	7
Option D:	8
18.	If a 10-bit ring counter has an initial state 1101000001, what is the state after the second clock pulse?
Option A:	0011010000
Option B:	0111010000
Option C:	1100000000
Option D:	0000000000

19.	Johnson counters are ____________
Option A:	Synchronous counters
Option B:	Asynchronous counters
Option C:	Decade counters
Option D:	True Decade counters
20.	Which of the following can be the name of an architecture?
Option A:	arch 1
Option B:	1arch
Option C:	arch_1
Option D:	Architecture

Q2		Solve any Two Questions out of Three 10 marks each
A	i	A seven-bit hamming code is received as 1011011. Assume even parity and state whether the received code is correct or wrong, if wrong locate the error bit and write correct code.
	ii	Simplify using Boolean algebra Z= A[B +C (AB +AC)]
B	Reduce equation using Quine McCluskey method and realize circuit using basic gates. F(A,B,C,D) = Σm(1,2,3,5,9,12,14,15) + d(4,8,11)	
C	i	Implement the following using only one 8:1 Mux. F(A,B,C,D) = Σm (0,2,3,6,8,9,13,14)
	ii	Design 1 bit magnitude comparator.

Q3		Solve any Two Questions out of Three 10 marks each
A	Design MOD 6 synchronous counter using T Flip Flop	
B	Convert SR flipflop to JK flipflop and D flipflop	
C	i	Design a Full Subtractor using only NAND gates
	ii	Write short note VHDL modelling styles

University of Mumbai

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

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: SE Semester III

Course Code: CSC303 and Course Name: Discrete Mathematics

Time: 2 hour Max. Marks: 80

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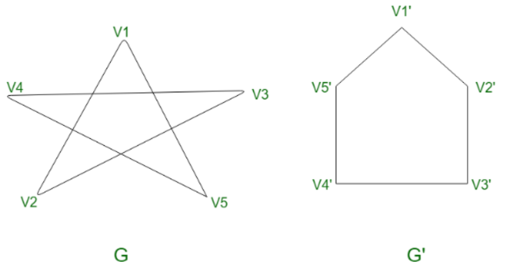
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Power set of empty set has exactly _________ subset.
Option A:	One
Option B:	Two
Option C:	Three
Option D:	Zero
2.	The compound propositions p and q are called logically equivalent if ________ is a tautology.
Option A:	$p \leftrightarrow q$
Option B:	$p \rightarrow q$
Option C:	$\neg (p \vee q)$
Option D:	$\neg p \vee \neg q$
3.	Which of the following relations is the reflexive relation over the set {1, 2, 3, 5}?
Option A:	{(5,5), (1,1), (2,2), (2,3)}
Option B:	{(3,3), (1,1), (2,2), (5,2)}
Option C:	{(4,4), (1,2), (2,2), (3,3)}
Option D:	{(5,5), (1,1), (2,2), (3,3)}
4.	Determine the partitions of the set {a,b,c,d} from the following subsets.
Option A:	{a,b},(a,b,c},{c,d}
Option B:	{a,b,c},{c,d}
Option C:	{a,b},{d,c,b}
Option D:	{b,a},{d,c}
5.	Suppose a relation R = {(2, 2), (5, 5), (5, 2), (7, 7), } on S = {2, 5, 7}. Here R is known as __________
Option A:	equivalence relation
Option B:	irreflexive relation
Option C:	symmetric relation
Option D:	empty relation
6.	When four coins are tossed simultaneously, in _______ number of the outcomes at most two of the coins will turn up as heads.
Option A:	17
Option B:	11
Option C:	28
Option D:	43

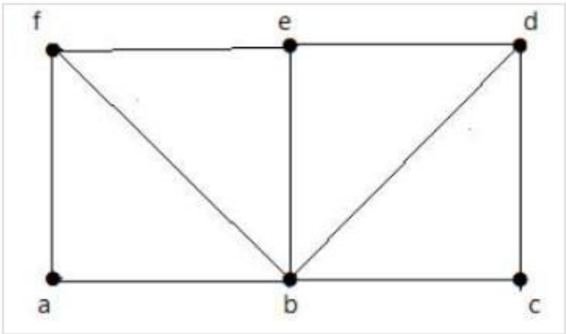
7.	A directed graph or digraph can have directed cycle in which ______
Option A:	starting node and ending node are different
Option B:	starting node and ending node are same
Option C:	minimum four vertices can be there
Option D:	ending node does not exist
8.	What is a complete digraph?
Option A:	connection of nodes without containing any cycle
Option B:	connecting nodes to make at least three complete cycles
Option C:	start node and end node in a graph are same having a cycle
Option D:	connection of every node with every other node including itself in a digraph
9.	Which of the following two sets are equal?
Option A:	A = {1, 2 } and B = {1, 1}
Option B:	A = {1, 2} and B = {1, 3}
Option C:	A = {1, 2, 3} and B = {2, 1, 3}
Option D:	A = {1, 2, 4} and B = {1, 2, 3}
10.	Let P (x) denote the statement "x >5." Which of these have truth value true?
Option A:	P (0)
Option B:	P (1)
Option C:	P (2)
Option D:	P (9)
11.	The number of symmetric relations on a set with 4 distinct elements is _______
Option A:	2^9
Option B:	2^3
Option C:	2^4
Option D:	2^{12}
12.	How many two-digit numbers can be made from the digits 1 to 9 if repetition is allowed?
Option A:	9
Option B:	18
Option C:	81
Option D:	99
13.	The graph representing universal relation is called ________
Option A:	complete digraph
Option B:	partial digraph
Option C:	empty graph
Option D:	partial subgraph
14.	A non empty set A is termed as an algebraic structure _________
Option A:	with respect to binary operation *
Option B:	with respect to ternary operation ?
Option C:	with respect to binary operation +
Option D:	with respect to unary operation –

15.	The statement (~Q<->R)∧~R is true when?
Option A:	Q: True R: False
Option B:	Q:True R:True
Option C:	Q: False R:True
Option D:	Q: False R: False
16.	¬ (p ∨ A) ∧ (p ∧ A) is a ___________
Option A:	Tautology
Option B:	Contradiction
Option C:	Contingency
Option D:	Zero
17.	How many binary relations are there on a set S with 5 distinct elements?
Option A:	2^5
Option B:	2^{25}
Option C:	2^{10}
Option D:	2^{15}
18.	The less-than relation, <, on a set of real numbers is ______
Option A:	not a partial ordering because it is not asymmetric and irreflexive equals antisymmetric
Option B:	a partial ordering since it is asymmetric and reflexive
Option C:	a partial ordering since it is antisymmetric and reflexive
Option D:	not a partial ordering because it is not antisymmetric and reflexive
19.	An algebraic structure _________ is called a semigroup.
Option A:	(Q, +, *)
Option B:	(P, *)
Option C:	(P, +)
Option D:	(+, *)
20.	Condition for monoid is __________
Option A:	(a+e)=a
Option B:	(a*e)=(a+e)
Option C:	a=(a*(a+e)
Option D:	(a*e)=(e*a)=a

subjective/descriptive questions

Q2. 20 Marks	**Solve any Four out of Six** **5 marks each**
A	A survey in 1986 asked households whether they had a VCR, a CD player or cable TV. 40 had a VCR. 60 had a CD player; and 50 had cable TV. 25 owned VCR and CD player. 30 owned a CD player and had cable TV. 35 owned a VCR and had cable TV. 10 households had all three. How many households had at least one of the three?
B	Prove by Mathematical induction that for all positive integers n 1+2+3+…+n = n(n+1)/2.
C	Let D_{30} be the divisors of 30. Draw the Hasse diagram for (D_{30},|), where "|" represents the divisibility relation.
D	Let (Z, *) be an algebraic structure, where Z is the set of integers and the operation * is defined by n * m = maximum of (n, m). Show that (Z, *) is a semi group. Is (Z, *) a monoid ?. Justify your answer.

E	A code have 4 digits in a specific order, the digits are between 0-9. How many different permutations are there if one digit may only be used once?
F	Consider the following two graphs –  Are two graphs isomorphic?

Q3. 20 Marks	**Solve any Four Questions out of Six** **5 marks each**
A	Find g o f and f o g if f: R→R and g: R→R are given by f(x) = cosx and g(x)=3x^2. Show that g o f ≠ f o g.
B	Let z denote the set of the integers {0,1,2,…,n-1}. Let * be a binary operation on z_n denote such that a*b= the reminder of ab divided by n i) Construct the table for the operation O for n=4 ii) Show that(z_n ,*) is a semigroup for any n
C	Explain the Euler path and circuit and Hamiltonian path and circuit. Do the following graphs have Euler as well as Hamiltonian Path/Circuit? Justify your answer and give the corresponding paths 
D	Let R is a binary relation. Let S= {(a,b) | (a,c) ∈ R and (c,b) ∈R for some C} Show that if R is an equivalence relation then S is also an equivalence relation.
E	Find the complete solution of the recurrence relation $a_n + 2\, a_{n-1} = n + 3$ for n≥1 and with $a_0 = 3$
F	Use the laws of logic to show that [(p→q)^~q]→~p is a tautology

University of Mumbai

Examination 2020 under cluster __(Lead College: _________)

Examinations Commencing from 15h June to 26th June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: CSC 304 and Course Name: Electronic Circuits and Communication Fundamentals

Time: 2 hour Max. Marks: 80

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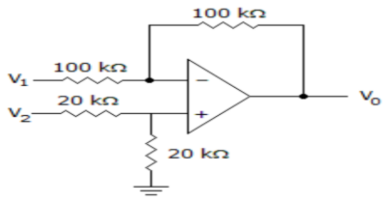
Q1. (40 marks)	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Amplifiers and oscillators using BJT, operate in which of the following region?
Option A:	Inverted mode
Option B:	Active
Option C:	Cut off
Option D:	Saturation
2.	Which operating condition is satisfied by the transistor if it is supposed to function in cut-off region?
Option A:	$V_{CE} > 0$
Option B:	$V_{CE} = 0$
Option C:	$V_{CE} < 0$
Option D:	$V_{CE} = V_{cc}$
3.	In a pnp transistor, which of the following are the current carriers?
Option A:	Acceptor ions
Option B:	Donor ions
Option C:	Free electrons
Option D:	Holes
4.	A transistor is a …………… operated device
Option A:	Current
Option B:	Voltage
Option C:	Both Current and Voltage
Option D:	Power
5.	In a transistor, current relationship is given as
Option A:	$I_C = I_E + I_B$
Option B:	$I_B = I_C + I_E$
Option C:	$I_E = I_C – I_B$
Option D:	$I_E = I_C + I_B$
6.	The most commonly used semiconductor in the manufacture of a transistor is ………….
Option A:	Germanium

Option B:	Silicon
Option C:	Carbon
Option D:	Nitrogen
7.	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
8.	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
9.	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:	1,000,00
Option B:	1000
Option C:	101
Option D:	100
10.	How many op-amps are required to implement this equation ? V0=V1
Option A:	2
Option B:	3
Option C:	4
Option D:	1
11.	Determine the output voltage when v1=v2=1V 
Option A:	0V
Option B:	-2V
Option C:	1V
Option D:	2V
12.	The common mode gain of an Op-AMP is
Option A:	Very high
Option B:	Very low
Option C:	Unity
Option D:	Unpredictable
13.	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
14.	Mathematically, the number of sidebands in frequency modulated system is
Option A:	Infinite
Option B:	One
Option C:	Two
Option D:	Zero
15.	In superheterodyne 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
16.	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
17.	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
18.	Calculate the minimum sampling rate to avoid aliasing when a continuous time signal is given by $x(t) = 5 \cos 400\pi t$
Option A:	100
Option B:	200
Option C:	400
Option D:	250
19.	When two or more signals share a common channel, it is called
Option A:	Multiplexing
Option B:	Channeling
Option C:	Switching
Option D:	Sub-channeling
20.	Entropy of a random variable is
Option A:	0
Option B:	1
Option C:	Infinite
Option D:	Can not be determined

Q2.	**Solve any Two Questions out of Three, 10 marks each**

(20 Marks)	
A	Discuss the principle of operation of super heterodyne receiver in detail along with waveforms at each stage.
B	Draw and explain opamp inverting comparator. Draw input and output waveforms for Vref >0 and also for Vref <0.
C	What are different regions of characteristics of Bipolar Junction Transistor? Explain in detail.

Q3 **(20 Marks)**	
A	**Solve any Two 5 marks each**
i.	How DSBSC is produced with the help of balanced modulator?
ii.	What is sampling theorem? What happens if sampling is done at fs < 2 fmax?
iii.	Compare various pulse modulation techniques.
B	**Solve any One 10 marks each**
i.	Give each component of Analog Communication System in detail.
ii.	Draw an op-amp integrating circuit together with the circuit waveforms. Explain the circuit operation.

University of Mumbai

Examination 2020 under cluster 04 (Lead College: Pillai COE)

Examinations Commencing from 15th June to 26th June 2021

Program: **Computer Engineering**

Curriculum Scheme: R2016

Examination: SE Semester III

Course Code: CSC305 and Course Name: Data Structures

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.	Which sorting techniques uses divide and conquer methodology?
Option A:	Bubble sort
Option B:	Insertion sort
Option C:	Quick sort
Option D:	Radix sort
2.	Which is not the Linear Data Structures?
Option A:	Stack
Option B:	Queue
Option C:	Tree
Option D:	Linked List
3.	Which is not the type of Non-Linear Data Structure?
Option A:	Circular Queue
Option B:	Tree
Option C:	Graph
Option D:	Forest
4.	What is the time complexity for merge sort?
Option A:	O(n log n)
Option B:	O(n)
Option C:	O(n^2)
Option D:	O(log n)
5.	The principal of Queue is?

Option A:	First in first out
Option B:	Last in first out
Option C:	Last in last out
Option D:	Last out first in
6.	In Queue ADT what is required?
Option A:	int front
Option B:	int front, rear, array[ ]
Option C:	int front, rear
Option D:	int front, rear, top
7.	Which is not the Application of Stack?
Option A:	Well form-ness of parenthesis
Option B:	Infix to post fix conversion
Option C:	Post fix evaluation
Option D:	A Steal Job Scheduling Algorithm
8.	What is not the operation of Double Ended Queue?
Option A:	insert_front
Option B:	delete_front
Option C:	insert_rear
Option D:	delete_intermediate
9.	The malloc function is used for
Option A:	memory refresh
Option B:	memory allocation
Option C:	memory overflow
Option D:	memory underflow
10.	The Doubly Linked list requires
Option A:	1 data, 2 pointer field
Option B:	2 data, 1 pointer field
Option C:	2 data, 2 pointer field
Option D:	1 data, 1 pointer field
11.	The worst time complexity for insertion sort is

Option A:	O(n)
Option B:	O(n^2)
Option C:	O(n log n)
Option D:	O(log n)
12.	What is the advantage of circular queue over linear queue?
Option A:	time is saved
Option B:	memory is saved
Option C:	Time and memory are saved
Option D:	Cost is saved
13.	Where is the possibility to insert a node in singly linked list?
Option A:	at the end only
Option B:	at the beginning only
Option C:	intermediate or in between only
Option D:	at the beginning, in between and at end.
14.	Which is not the type of Linked List?
Option A:	Doubly Linked List
Option B:	Circular Linked List
Option C:	Triply Linked List
Option D:	Singly Linked List
15.	Searching is defined as
Option A:	process of arranging the records in a specific order
Option B:	process of identifying the location of a record
Option C:	process of combining two different sorted records to produce a single sorted data set
Option D:	process of accessing each record exactly once
16.	Which is not the type of binary tree?
Option A:	Strictly binary tree
Option B:	Nearly complete binary tree
Option C:	Perfect binary tree
Option D:	B tree
17.	Which of the statement is incorrect?
Option A:	Every tree is a graph
Option B:	Every graph is tree
Option C:	The in degree of a root node is zero
Option D:	The out degree of a leaf node is zero

18.	Creation of binary tree from tree traversal is possible if we have
Option A:	Post order traversal or Pre order traversal
Option B:	In order traversal or Pre order traversal
Option C:	Pre order traversal or In order traversal
Option D:	Along with in order traversal, Pre order traversal or Post order traversal
19.	Graph Traversal Techniques are:
Option A:	Breadth first search
Option B:	Depth first search
Option C:	And Or Search
Option D:	Breadth first search and Depth first search
20.	A Graph can be represented by
Option A:	Adjacency List
Option B:	Adjacency Matrix
Option C:	Adjacency List and Adjacency Matrix
Option D:	Tree and forest

Q2. **(20 Marks)**	**Attempt the following:**
A	**Solve any Two** **5 marks each**
i.	*Evaluate the post fix expression 653+9*+ showing all the steps.*
ii.	*Develop a program for binary search.*
iii.	*What is a graph? Explain methods to represent graph.*
B	**Solve any One** **10 marks each**
i.	*Explain different rotations that can be used in AVL Tree. Construct AVL tree from the following data set: 14,10,1,20,17,24,18,12,15,11,4,6.*
ii.	*Write a program to implement Singly Linked List. Provide the following operations: a) insert a node at a specified location b) Delete a node from end c) Display the list*
Q3. **(20 Marks)**	**Attempt the following:**
A	**Solve any Two** **5 marks each**
i.	*Explain different types of data structures with example of each.*
ii.	Construct Huffman tree and determine the code for each symbol in the word ENGINEERING.
iii.	State advantages of Linked List over arrays. State applications of Linked List.
B	**Solve any One** **10 marks each**
i.	*Store the following data using linear probing and quadratic probing in a hash table of size 11. Data set: 25,5,10,11,22,33,40,50,30.*
ii.	*Give algorithm to convert in fix expression to post fix expression. Also convert in fix expression (A-B/C)*(D/E-F) to post fix expression showing all the steps.*

University of Mumbai

Examination 2021 under cluster __(Lead College: _________)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Computer Engineering

Curriculum Scheme: Rev 2019 'C' Scheme

Examination: SE Semester III

Course Code: CSC301 and Course Name: Engineering Mathematics III

Time: 2 hour Max. Marks: 80

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

University of Mumbai

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

Examinations Commencing from 15th June 2021 to 26th June2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: SE SemesterIII

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

Time: 2 hour Max. Marks: 80

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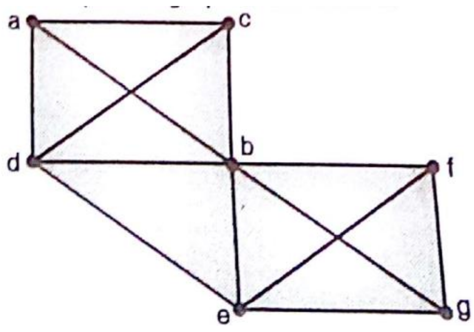
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The binary relation {(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)} on the set {1, 2, 3,4} is ___________
Option A:	Reflexiive, Symmetric and Transitive
Option B:	Irreflexive, Symmetric and Transitive
Option C:	Neither Reflexiive, nor Irreflexive but Transitive
Option D:	Irreflexive and Antisymmetric
2.	Given the following statements pick the one that is not a tautology?
Option A:	$(p \rightarrow q) \rightarrow q$
Option B:	$p \rightarrow (p \lor q)$
Option C:	$(p \land q) \rightarrow (p \rightarrow q)$
Option D:	$(p \land q) \rightarrow (p \lor q)$
3.	Given the set {1, 2, 3, 4} How many numbers must be selected from it to guarantee that at least one pair of these numbers add up to 7?
Option A:	14
Option B:	5
Option C:	9
Option D:	24
4.	All Isomorphic graph must have___________ representation
Option A:	cyclic
Option B:	tree
Option C:	adjacency list
Option D:	adjacency matrix
5.	The cardinality of the set of odd positive integers less than 10 is ?
Option A:	5
Option B:	10
Option C:	3
Option D:	20
6.	If g(x)= 3x+2 then gog(x) :
Option A:	6x+4
Option B:	9x+8
Option C:	3x-2

Option D:	2-3x
7.	Length of path is
Option A:	Number of Edges in the path
Option B:	Number of circuits in the path
Option C:	Number of loops in the path
Option D:	Number of Vertices in the path
8.	If every two elements of a poset are comparable then the poset is called
Option A:	Sub ordered poset
Option B:	Totally ordered poset
Option C:	Sub Lattice
Option D:	Semigroup
9.	A___________ has a greatest element and a least element which satisfy 0<=a<=1 for every a in the lattice(say, L).
Option A:	semilattice
Option B:	Join semilattice
Option C:	Meet semilattice
Option D:	Bounded semilattice
10.	Let S = {a, b, c, d, e, f , g}. Determine which of the following are partitions of S:
Option A:	P1 = [{a, c, e}, {b}, {d, g}],
Option B:	P2 = [{a, e, g}, {c, d}, {b, e, f }],
Option C:	P3 = [{a, b, e, g}, {c}, {d, f }],
Option D:	P4 = [{a, b, c, d, e, f , g},{c,g}]
11.	Solution of linear homogenous recurrence relation: $a_n = 3a_{n-1} - 2a_{n-2}\ \ with\ a_0 = 1\ , a_1 = 3\ , n \geq 2$ is
Option A:	$a_n = (-1) + 2^n$
Option B:	$a_n = (-1) + 3.2^n$
Option C:	$a_n = (-1)(-1)^n + 2^n$
Option D:	$a_n = (-1) + 2.2^n$
12.	The number of integers between 1 and 1000 that are divisible by 3 but not by2 or 5 is
Option A:	132
Option B:	127
Option C:	134
Option D:	143
13.	If six numbers are selected from 1 to 15,find the least number of selections which will have the same sum
Option A:	61
Option B:	91
Option C:	41
Option D:	51
14.	The number of relations from A = {a, b, c} to B = {1, 2}
Option A:	54

Option B:	74
Option C:	64
Option D:	84
15.	Let G = (Z_6,$+_6$) is an Abelian group then the inverse element of 4 is ______.
Option A:	0
Option B:	1
Option C:	2
Option D:	3
16.	If $\mathbf{G} = (\mathbb{Z}_7{}^*, \times_7)$ is a group , the inverse of elements 2, 3 and 6 are ______
Option A:	2,3 and 6
Option B:	1,2 and 3
Option C:	4,5 and 6
Option D:	3,4 and 6
17.	The complete graph with four vertices has _________edges.
Option A:	3
Option B:	4
Option C:	5
Option D:	6
18.	Which of the following function is bijective?
Option A:	$f: R \to R\ defined\ as\ f(x) = x^2$
Option B:	$f: R \to R\ defined\ as\ f(x) = 3^x$
Option C:	$f: R \to R\ defined\ as\ f(x) = x^3 - x$
Option D:	$f: R \to R\ defined\ as\ f(x) = x^3 + 1$
19.	Let a POSET L,≤ be a Lattice. Then for every pair of elements a,b∈L has _______.
Option A:	a GLB.
Option B:	a LUB.
Option C:	both GLB and LUB.
Option D:	Both Maximal and Minimal
20.	In a graph a node which is not adjacent to any other node is called ______ node**.**
Option A:	Simple
Option B:	Isolated
Option C:	Initiating
Option D:	Different

Q2	**Solve any Four out of Six** **5 marks each**
A	Let A be a set of integers, Let R be a Relation on AXA defined by (a,b)R(c,d) if

	and only if a+d = b+c. Prove that R is an Equivalence Relation.
B	Show that the sum of the cubes of three consecutive integers is divisible by 9
C	Prove that the set A=(0,1,2,3,4,5) is a finite Abelian group under Addition modulo 6
D	Find the Transitive closure of the relation R on A={1,2,3,4} where the Relation R={(1,2),(2,2),(2,4),(3,4),(4,3),(3,2),(4,1)}
E	Check whether Euler cycle and Euler Path exists in the Graph given below. 
F	Let f : A→B be a Function from A to B . Prove that f^{-1} exists if and only if f is a Bijective Function.

Q3.	**Solve any Two Questions out of Three 10 marks each**
A	Draw the Hasse Diagram of $\mathbf{D}_{72}$ and $\mathbf{D}_{105}$ and check whether they are Lattice.
B	Consider the Set A={1,2,3,4,5,6} under multiplication Modulo 7. 1) Prove that A is a Cyclicgroup 2) Find the orders and the Subgroups generated by {2,3}and {3,4}
C	A Function $R - \left\{\frac{7}{3}\right\} \to R - \{\frac{4}{3}\}$is defined as $f(x) = \frac{(4x-5)}{(3x-7)}$Prove that f is Bijective and find the rule for f^{-1}

University of Mumbai

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

Examinations Commencing from 15th June 2021 to 26th June2021

Program: **Computer Engineering**

Curriculum Scheme: Rev 2019

Examination: SE Semester III

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

Time: 2 hour Max. Marks: 80

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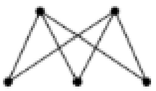
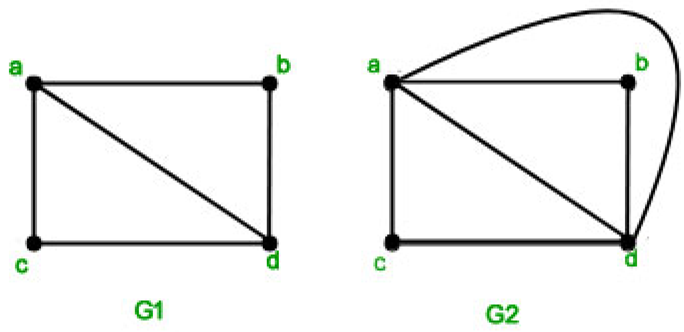
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.**
1.	In a class of 50 students , 20 students play cricket and 16 students play football. It is found that 10 students play both the games. Find out the number of students who play neither of the games.
Option A:	42
Option B:	24
Option C:	12
Option D:	14
2.	Let A={1,2,3,4,5,6,7,8} . Let xRy whenever y is divisible by x, so R is a ______________
Option A:	Equivalence Relation
Option B:	Partial Order Relation
Option C:	Symmetric
Option D:	Neither Equivalence Nor Partial Order Relation
3.	(p^p)^(p→(q^q)) is equivalent to _________________.
Option A:	p→q
Option B:	q→p
Option C:	p^q
Option D:	None of the above
4.	If f and g are onto then function (gof) is ?
Option A:	one to one
Option B:	one to many
Option C:	into
Option D:	onto
5.	Consider P : Food is good , Q: Service is good , R: Restaurant is 5-star. Write the symbolic notation of the statement " It is not true that 5 star rating always means good food and good service"
Option A:	(P ^ Q)--> R
Option B:	~(R →(P ^Q))
Option C:	R → ~(P ^ Q)
Option D:	P^~Q

6.	A__________________ is a semigroup (A,*) that has an identity element.
Option A:	Cyclic group
Option B:	Lattice
Option C:	Poset
Option D:	Monoid
7.	A graph having all vertices with equal degree is known as ____________.
Option A:	Regular Graph
Option B:	Euler Graph
Option C:	Simple Graph
Option D:	Hamiltonian Graph
8.	Which of the following is a Tautology?
Option A:	(~p v p) ^ q
Option B:	(p v q) → (p → q)
Option C:	((p v q)^ ~p) → q
Option D:	(~p v ~q) → (p → q)
9.	A graph has an Euler circuit if__________________________
Option A:	it is connected and has an even number of vertices.
Option B:	it is connected and has an even number of edges.
Option C:	it is connected and every vertex has an odd degree.
Option D:	every vertex has even degree
10.	Let f and g be the function from the set of integers to itself, defined by f(x) = 3x + 1 and g(x) = 4x + 4. Then the composition of f and g is ____________
Option A:	12x+4
Option B:	12x+5
Option C:	12x + 13
Option D:	12x+8
11.	k10 is a complete graph on 10 vertices and will have ______________ edges.
Option A:	45
Option B:	54
Option C:	40
Option D:	42
12.	Solution of linear homogenous recurrence relation: $a_n = 3a_{n-1} - 2a_{n-2}\ with\ a_0 = 1, a_1 = 3, n \geq 2$
Option A:	$a_n = (-1) + 2^n$
Option B:	$a_n = (-1) + 3.2^n$
Option C:	$a_n = (-1)(-1)^n + 2^n$
Option D:	$a_n = (-1) + 2.2^n$
13.	Let A be a finite set of size n, the number of elements in the power set of A is
Option A:	2^{n}
Option B:	n^{2}
Option C:	$(2n)^2$
Option D:	2^{2n}

14.	The transitive closure of the relation R={(a,b),(b,c),(c,d)(e,d)} on set A={a,b,c,d,e} is
Option A:	{(a,b),(b,c),(c,d),(e,d),(a,c)}
Option B:	{(a,b),(b,c),(c,d),(e,d),(a,c),(a,d),(b,d)}
Option C:	{(a,b),(b,c),(c,d),(e,d),(a,c),(a,d)}
Option D:	{(a,b),(b,c),(c,d),(d,e),(a,c),(a,d)}
15.	What is the correct translation of the following statement into mathematical logic? “Some real numbers are rational”
Option A:	$\exists$x(real(x) v rational(x))
Option B:	$\exists$x(real(x) ^ rational(x))
Option C:	$\forall$x (real(x) → rational(x))
Option D:	$\exists$x(rational(x) → real(x))
16.	The minimum number of edges in a connected graph with n vertices is _____.
Option A:	n-1
Option B:	n
Option C:	n+1
Option D:	n+2
17.	The following graph is ______________________. 
Option A:	Bipartite Graph
Option B:	Complete Bipartite Graph
Option C:	Mixed Graph
Option D:	Simple Graph
18.	What is the minimum number of students required in a class to be sure that at least 6 will receive the same grade , if there are five possible grades A,B,C,D and E.
Option A:	62
Option B:	66
Option C:	26
Option D:	22
19.	Which of the following four subset of integers N is not closed under the operation of multiplication.
Option A:	A={0,1}
Option B:	F={2,4,6,….}
Option C:	B={1,2}
Option D:	E={1,3,5,…..}
20.	The ________________ between two words is the number of differences between corresponding bits.
Option A:	Hamming code

Option B:	Hamming distance
Option C:	Hamming rule
Option D:	Hamming parity checks

Q2. **(20 Marks)**	**Solve any Four questions out of Six.** **5 marks each**
A	Find the CNF form of $(\sim a \rightarrow b) \wedge (a \leftrightarrow b)$
B	Define the following with example 1.Ring 2. Bipartite Graph 3.Chain 4.Semigroup 5. Sublattice
C	Define Euler Path and Euler Circuit. Check whether Euler Path , Euler Circuit exist in the following graphs. 
D	Consider G={1,2,3,4,5,6} under the multiplication modulo 7. i) Find multiplication table of G ii)Find $2^{-1},3^{-1},6^{-1}$ iii) Is G cyclic?
E	Prove using Mathematical Induction that n^3+2n is divisible by 3 for all n >=1
F	Define and give examples of injective surjective and bijective functions. Check the injectivity and surjectivity of the following function $f : N \rightarrow N$ given by $f(x)=x^3$

Q3. **(20 Marks)**	**Solve any Two Questions out of Three .** **10 marks each**
A	Let D60 be the poset consisting of all the positive divisors of 60 under the partial order of divisibility. (a) Write down the elements of D60? (b) Draw the Hasse Diagram of D60. (c) Define Lattice. Is D60 a lattice? Give a reason for your answer
B	Define Isomorphic Graph. Draw K6 and K3,3 graphs . Find whether they are Isomorphic or not?
C	Let A= {a,b,c,d} and let R={(a,a),(a,b),(a,c),(b,a),(b,b),(c,a),(b,c),(c,b),(c,c),(d,d) }. Show that R is a

	equivalence relation and determine the equivalence classes and find the rank of R.

University of Mumbai

Examination 2020 under cluster 4 (Lead College: PCE)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester: III

Course Code: CSC303 and Course Name: Data Structures

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.	To convert the infix expression (D+(C-E)*F) into postfix, how many pop operations will be required?
Option A:	3
Option B:	4
Option C:	5
Option D:	6

2.	What is the operation performed by the following code with respect to Binary search tree, if 'rt' is pointing to the root node:
	`struct node *ptr=rt;`
	`struct node *fun(struct node *ptr)`
	`{`
	`    if(ptr==NULL)`
	`        return NULL;`
	`    else if(ptr->right==NULL)`
	`    return ptr;`
	`    else`
	`        return fun(ptr->right);`

Option A:	returns the smallest value in the binary search tree
Option B:	returns the right child of root node
Option C:	Returns the largest value in the binary search tree
Option D:	Returns all right nodes in the binary search tree
3.	Which of the following statements is not correct for queues?
Option A:	Queue is used in process and job scheduling
Option B:	Queue is used in depth first search traversal
Option C:	The last inserted elements is removed at the last from queue
Option D:	Elements in the queue can be removed based on their priority.
4.	The following postfix expression with single digit operands is evaluated using a stack: 2 3 ^ 4 / 7 5 + * 3 * Note that ^ is the exponentiation operator. The top two elements of the stack after '+' is evaluated are:
Option A:	5,7
Option B:	7,4

Option C:	12,8
Option D:	12,2

5.	After performing these set of operations, what will be the contents of a double ended queue?
	`InsertFront(16);`
	`InsertRear(33);`
	`InsertRear(40);`
	`DeleteFront();`
	`InsertRear(25);`

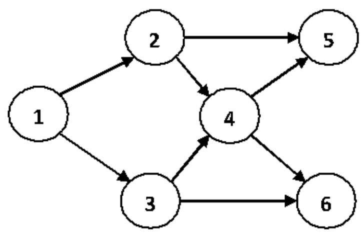
Option A:	33,40,25
Option B:	16,33,25
Option C:	16,33,40
Option D:	25,33,40
6.	Which of the following statements about stacks is incorrect?
Option A:	Stacks can be implemented using linked lists
Option B:	Stacks are first-in, first-out (FIFO) data structures
Option C:	New nodes can only be added to the top of the stack
Option D:	The last node (at the bottom) of a stack has a null (0) link

7.	What operation the following pseudo code indicates :
	`void func(Queue Q)`
	`{`
	`    if(Q not empty) {`
	`        int i=delete(Q);`
	`        func(Q);`
	`        insert(Q,i); }`
	`}`

Option A:	Reverses queue elements
Option B:	Keeps queue unchanged
Option C:	Deletes front element from queue
Option D:	Deletes all elements from queue

8.	What is the output of the following code, if linked list contains elements 16,37,28,49:
	`void fun1(struct Node* head)`
	`{`
	`    if (head == NULL)`
	`        return;`
	
	`    fun1(head->next);`
	`        printf("->%d", head->data);`
	`}`

Option A:	->16->37->28->49
Option B:	->49->28->37->16
Option C:	->37->28-.>49->16
Option D:	->28->49->37->16
9.	How many pointers are contained as data members in the nodes of a circular,

	doubly linked list of integers with seven nodes?
Option A:	7
Option B:	8
Option C:	14
Option D:	15
10.	Which is not the property of Linear data structures ?
Option A:	Contiguous allocation
Option B:	Sequential access
Option C:	Static or dynamic allocation
Option D:	Abstract Data type
11.	Consider the DAG with Consider V = {1, 2, 3, 4, 5, 6}, shown below. Which of the following is not a breadth first search sequence for the graph? 
Option A:	1 2 3 4 5 6
Option B:	1 3 2 4 6 5
Option C:	1 3 2 6 4 5
Option D:	3 2 4 1 6 5
12.	A binary search tree is created by inserting the numbers 2, 6, 0, 1, 9, 8, 4, 7, 3, 5. What is the post-order traversal sequence of the resultant tree?
Option A:	0 1 2 3 4 5 6 7 8 9
Option B:	0 2 4 3 1 6 5 9 8 7
Option C:	1 0 3 5 4 7 8 9 6 2
Option D:	1 0 3 4 5 6 7 8 9 2

13.	What the following code do:
	ptr=head;
	while(ptr!=NULL) {
	  tr=ptr->next->next; }

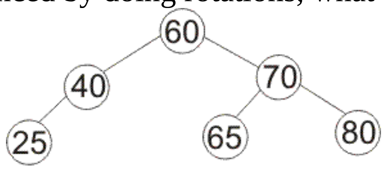
Option A:	Traverse list
Option B:	Traverse even position nodes
Option C:	Traverse odd position nodes
Option D:	Deletes odd position nodes

14.	Select the operation performed by the following code segment with respect to binary tree:
	
	`void func(struct Node* p)`
	`{`
	    `if (p == NULL)`
	        `return;`
	    `else`

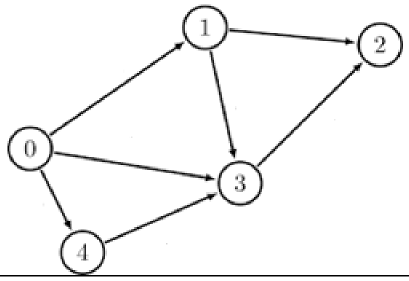
```
        {
            struct Node* temp;

            func(p->left);
            func(p->right);


            temp     = p->left;
            p->left = p->right;
            p->right = temp;
        }
    }
```

Option A:	find the minimum element in a binary search tree
Option B:	find the maximum element in a binary search tree
Option C:	Interchange of nodes
Option D:	Converts tree into its mirror image
15.	If you insert 75 into the following binary search tree using the algorithm that keeps the tree height-balanced by doing rotations, what tree do you get? 
Option A:	Left child of 65
Option B:	Right child of 65
Option C:	Right child of 40
Option D:	Left child of 80
16.	How many nodes will be created in a B-tree by inserting the keys : 11,14,17,20,27,31,41,29,75,30 (Assume ORDER 5) ?
Option A:	4
Option B:	5
Option C:	6
Option D:	7
17.	Which of the following statement is incorrect with respect to graphs?
Option A:	A sequence of vertices that connect two nodes in a graph is called a path.
Option B:	Degree of vertex in a graph is the number of edges that touch it.
Option C:	A tree is a graph with cycles.
Option D:	In complete graph, every vertex is directly connected to every other vertex
18.	What is the worst case for linear search?
Option A:	Search key is available at first location
Option B:	Search key is available at last location
Option C:	Search key is available at middle of array
Option D:	Search key is available anywhere in the array
19.	In a Doubly linked list with 2 pointers namely, 'prev' and 'next', and a pointer 'Temp' pointing to some node except first or last node, which of the following statement will delete the element pointed by 'Temp'?

Option A:	Temp->prev->next=Temp->next ; Temp->next->prev=Temp->prev; free(temp);
Option B:	Temp->prev->next=Temp->prev ; Temp->next->prev=Temp->next; free(temp);
Option C:	Temp->prev->prev=Temp->next ; Temp->next->next=Temp->prev; free(temp);
Option D:	Temp->prev->prev=Temp->prev ; Temp->next->next=Temp->next; free(temp);
20.	Max .no. of nodes in a binary tree with level 6 are
Option A:	32
Option B:	63
Option C:	64
Option D:	31

Q2	**Solve any Four out of Six** **5 marks each**
A	Consider marks of 5 subjects of a student represented as singly linked list. Write a C program to compute the total and percentage of the student.
B	An array contains the elements – 8,13,17,26,44,56,88,97. Using binary search algorithm, trace the steps followed to find numbers 56 & 9. At each step, show the contents of low, high & mid and array after each iteration
C	Create a Binary Search Tree for the following sequence and write all the 3 traversal sequences from resultant BST: 45,39,56,12,34,78,32,10,89,54,67,81.
D	Use linear probing, insert the following keys in a hash table of size 11: 15,85,90,54,67,43,76. Find the number of collisions.
E	Illustrate topological sorting for the following graph: 
F	Define circular queue. Assume a circular queue with a capacity 6, currently having the elements 50 and 70 at locations 2 and 3 respectively. Show with example, the queue full and queue empty conditions by performing necessary operations on circular queue.

Q3.	**Solve any Two Questions out of Three** **10 marks each**
A	Create a AVL tree for the sequence: I, N, F, O, R, M, A, T, G. Consider the characters to arrange in alphabetic sequence. Show the tree after each insertion with balance factors.
B	Given the following frequencies for characters, find the Huffman code for all the characters: Character: S, T, I, N, G Frequency: 9, 16, 2, 30, 12
C	Define recursion. Differentiate between iteration and recursion. Write a C program to check whether a string is palindrome or not, with the help of stack data structure.

University of Mumbai

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

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: COMPUTER ENGINEERING

Curriculum Scheme: Rev2019

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

Course Code: CSC303 and Course Name: DATA STRUCTURE

Time: 2 hour Max. Marks: 80

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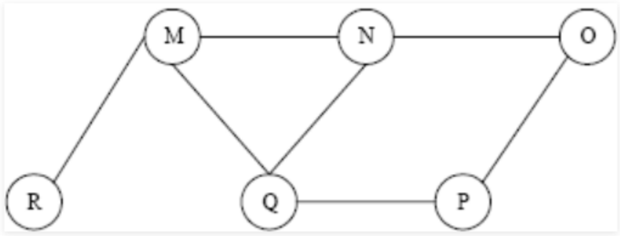
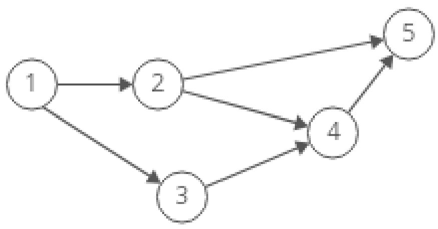
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following option is true about nonlinear data structures?
Option A:	data elements are present at multiple levels.
Option B:	Garbage each element is traversable through a single run.
Option C:	data elements are sequentially connected
Option D:	Efficient utilization of memory.
2.	The operation of processing each element in the list is known as
Option A:	Creation
Option B:	Insertion
Option C:	Deletion
Option D:	Traversal
3.	A full binary tree with n leaves contains
Option A:	n - 1 nodes
Option B:	$\log_2 n$ nodes
Option C:	2n – 1 nodes
Option D:	2^n nodes
4.	Queue data structure is used for -
Option A:	Preorder traversal in tree
Option B:	Postorder traversal in tree
Option C:	Depth first traversal in graph
Option D:	Breadth first traversal in graph
5.	Top value in stack changes -
Option A:	While checking overflow
Option B:	While checking underflow
Option C:	Before deletion of an element from stack
Option D:	After deletion of an element from stack
6.	For which of the following operation, Linked lists are not suitable data structures?
Option A:	Linear search
Option B:	Binary search
Option C:	Sorting
Option D:	traversal

7.	Stacks cannot be used to
Option A:	evaluate an arithmetic expression in postfix form
Option B:	implement recursion
Option C:	convert a given arithmetic expression in infix form to is equivalent postfix form
Option D:	allocates resources (like CPU) by the operating system
8.	The Depth First Search algorithm has been implemented on following graph. One possible order of visiting the nodes of the graph is 
Option A:	MRQNOP
Option B:	NMRQPO
Option C:	OPMQNR
Option D:	NORMQP
9.	Which of the following is essential for evaluating a postfix expression?
Option A:	An operator stack
Option B:	An operand stack
Option C:	An operator stack and an operand stack
Option D:	A parse tree
10.	A tree in which, at every node the height of its left sub tree and right sub tree differ at most by one is known as
Option A:	AVL Tree
Option B:	Complete Binary Tree
Option C:	Binary Search Tree
Option D:	Threaded Binary Tree
11.	Hash function f defined as f(key)=key mod 11, with linear probing, is used to insert the keys 37,38,72,48,98,56 into a table index starting from 0. What will be the location of key 16?
Option A:	5
Option B:	6
Option C:	7
Option D:	8
12.	Assume a binary search tree created by inserting the values 27, 9, 23, 22, 29, 25, 15, 50, 95, 60, 40. Number of nodes in the right subtree will be
Option A:	4
Option B:	5
Option C:	6
Option D:	7

13.	Which is not the valid balance factor for an AVL tree
Option A:	0
Option B:	1
Option C:	-1
Option D:	2
14.	B+ tree can contain a maximum of 7 pointers in a node. What is the minimum number of keys in leaves?
Option A:	3
Option B:	4
Option C:	5
Option D:	6
15.	Which of the following statement is not true about the doubly linked list?
Option A:	We can traverse in both the directions.
Option B:	It requires extra space
Option C:	Implementation of doubly linked list is easier than the singly linked list
Option D:	It stores the addresses of the next and the previous node
16.	Given, arr = {1,3,5,6,7,9,14,15,17,19} and the search_key = 19, how many comparisons are required using binary search?
Option A:	1
Option B:	2
Option C:	3
Option D:	4
17.	B-tree of order n is a order-n multiway tree in which each non-root node contains
Option A:	at most (n - 1)/2 keys
Option B:	exact (n - 1)/2 keys
Option C:	at least 2n keys
Option D:	at least (n - 1)/2 keys
18.	Postfix expression corresponding to the infix expression "(1+ 4) / (8 - 6) * 3" is
Option A:	1 4 / 8 6 * 3 -
Option B:	14 / 8 6 *- 3 +
Option C:	1 4 + 8 6 / - * 3
Option D:	1 4 + 8 6 - / 3 *
19.	Which of the following trait of a hash function is most desirable?
Option A:	It should be easy to implement
Option B:	It should occupy less space
Option C:	It should cause less collisions
Option D:	It should cause more collisions
20.	Topological sort can be implemented on a?
Option A:	Linked list
Option B:	Binary tree
Option C:	Directed acyclic graph
Option D:	Directed cyclic graph

Q2 (20 Marks Each)	**Solve any Four out of Six** **5 marks each**
A	Write a C functions to implement insertion and deletion in queue using linked list.
B	Explain deletion of a node in a binary search tree.
C	Find topological sorting sequence in the following graph: 
D	Consider a hash table with size = 7. Using Linear probing, insert the keys 99,33,23, 44, 56,43,19 into the table.
E	Define ADT. Write ADT for stack.
F	Write an algorithm to check the well-formedness of parenthesis in an algebraic expression using Stack data structure.

Q3. (20 Marks Each)	**Solve any Two Questions out of Three** **10 marks each**
A	Create a Huffman tree and find Huffman codes for each character in the string “CONNECTION”.
B	Write a C program for Singly Linked list for performing following operations i. Create SLL ii. Display SLL iii. Delete last node from SLL iv. Insert a node at start of SLL
C	Draw the B-tree of order 4 created by inserting the following data arriving in sequence: 25,10,16,32,20,5,27,39,7,11.

University of Mumbai

Examination 2020 under cluster __(Lead College: _________)

Examinations Commencing from 15^{h} June to 26th June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester III

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

Time: 2 hour Max. Marks: 80

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Q1. 40 marks	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks (2marks each)
1.	Convert hexadecimal number (8A9.B4) to binary equivalent.
Option A:	$(100010101001.110101)_2$
Option B:	$(100010101011.101101)_2$
Option C:	$(100010101001.101101)_2$
Option D:	$(100010101001.101011)_2$
2.	Write equivalent binary number for 10101010 gray code
Option A:	11001100
Option B:	10001100
Option C:	11000100
Option D:	11001110
3.	Which of the following the correct expression for two input NOR Gate
Option A:	$A + B$
Option B:	$A . B$
Option C:	$\overline{A} + \overline{B}$
Option D:	$\overline{A+ B}$
4.	Program Counter Holds
Option A:	The Instruction
Option B:	The Data
Option C:	Address of the Current Instruction which is executed
Option D:	Address of the Next Instruction to be fetched
5.	Perform binary subtraction using 2's complement representation. 23 - 48 (use 8 bit representation)
Option A:	10001110
Option B:	11110111
Option C:	11100111
Option D:	11001001
6.	Write number (15.5)10 in IEEE754 format
Option A:	41766666H
Option B:	C170000H
Option C:	41780006H
Option D:	41780000H

7.	In Booths Algorithm in one of the step the A=0110 Q=1100 Q_{-1}=0 and count is not zero what it will be the result of Arithmetic Right shift A,Q, Q_{-1}
Option A:	001101100
Option B:	001101101
Option C:	001101110
Option D:	111101100
8.	Perform hexadecimal addition 2F8 + 5A3
Option A:	79B
Option B:	9AB
Option C:	96B
Option D:	89B
9.	Choose correct equation of carry of full adder
Option A:	A OR B AND C_{in}(A XOR B)
Option B:	A AND B OR C_{in}(A XOR B)
Option C:	A AND B AND C_{in}
Option D:	A OR B OR C_{in}
10.	Which method of combination circuit implementation is widely adopted with maximum output functions and minimum requirement of ICs?
Option A:	Multiplexer Method
Option B:	Decoder Method
Option C:	Encoder Method
Option D:	Full Adder
11.	The addressing mode used in an instruction of the form ADD AX , 07h is _______ addressing mode
Option A:	Direct
Option B:	Indirect
Option C:	Immediate
Option D:	Register
12.	State table method is the method for designing
Option A:	Microprogram Control unit
Option B:	Hardwired Control Unit
Option C:	Memory Unit
Option D:	I/O devices
13.	Basic task for control unit is
Option A:	to perform logical operations
Option B:	to perform execution
Option C:	to initiate the resources
Option D:	to decode instructions and generate control signal
14.	Which is not true about Register memory
Option A:	fastest possible access
Option B:	only hundreds of bytes in size
Option C:	Large in Capacity

Option D:	Part of the processor
15.	Cache memory is implemented using
Option A:	Dynamic RAM
Option B:	Static RAM
Option C:	EPROM
Option D:	PROM
16.	Match the memory type with respective erasing mechanism used <table><tr><th>***Memory Type***</th><th>***Erasing Mechanism***</th></tr><tr><td>1- ROM & PROM</td><td>a- Electrically, Byte-level</td></tr><tr><td>2-EPROM</td><td>b- Electrically, Block-level</td></tr><tr><td>3- EEPROM</td><td>c- UV light, Chip Level</td></tr><tr><td>4- Flash Memory</td><td>d- Not Possible</td></tr></table>
Option A:	1 - c, 2 - d, 3 - b, 4 – a
Option B:	1 - d, 2 - a, 3 - c, 4 – b
Option C:	1 - d, 2 - b, 3 - a, 4 – c
Option D:	1 - d, 2 - c, 3 - a, 4 – b
17.	In a Pipelined Processing System The Instruction $A \leftarrow 3 + A \quad B \leftarrow 4 \times A$ Leads _____________ Hazard
Option A:	Resource Hazard
Option B:	Structural Hazard
Option C:	Data Hazard
Option D:	Branch Hazard
18.	Which is not true about Instruction Pipelining
Option A:	It will improve system performance in terms of throughput.
Option B:	Pipeline rate limited by slowest pipeline stage
Option C:	Unbalanced lengths of pipe stages reduces speedup
Option D:	Pipelining will not be affected by branching instruction.
19.	Flynn's taxonomy classifies computer architectures based on
Option A:	the number of instructions that can be executed
Option B:	how they operate on data.
Option C:	the number of instructions that can be executed and how they operate on data.
Option D:	None of the Above
20.	We can expand the processor bus connection by using
Option A:	SCSI bus
Option B:	PCI bus
Option C:	Controllers
Option D:	Multiple bus

Q2. (20 Marks)	**Solve any Four out of Six (5 marks each)**
A	Differentiate between Computer Organization and Architecture with a example
B	Describe the detailed Von-Neumann Model with a neat block diagram
C	Explain any five addressing Modes with examples
D	Write Short Note on SR Flip Flop
E	Explain Hardwired control unit design method (state table method)
F	Differentiate between Hardwired control unit and Micro programmed control unit

Q3. (20 Marks)	**Solve any two 10 marks each**
A	Consider a Cache memory of 16 words. Each block consists of 4 words. Size of the main memory is 128 bytes. Draw the Associative Mapping and Calculate the TAG and WORD size.
B	Draw the flow chart of Booths algorithm for signed multiplication and Perform -7 x -3 using booths algorithm
C	Write short note on Flynn’s classification

University of Mumbai

Examination 2020 under cluster __(Lead College: _________)

Examinations Commencing from 15h June to 26th June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2019

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

Course Code: CSC304

Course Name: Digital Logic & Computer Organization and Architecture

Time: 2 hour Max. Marks: 80

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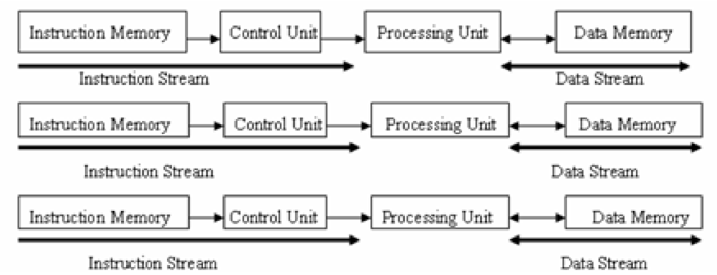
Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	What is the Function of MAR
Option A:	Read/write a word form memory
Option B:	Specify an address of memory
Option C:	Contains the 8 bit opcode
Option D:	Store address of next instruction
2.	What is does the Instruction Register holds
Option A:	It Holds the Address of the Current Instruction
Option B:	It Holds the Address of the Next Instruction
Option C:	It Holds the Current Instruction
Option D:	It Holds the Next Instruction
3.	What will be the Value stored in Register A & Q of Booths Algorithm if we multiply 5 & -6
Option A:	00011110
Option B:	11100001
Option C:	11100010
Option D:	11100011
4.	The normalized form of 100001111.001 is
Option A:	1.00001111001 x 2 raise to -8
Option B:	1.00001111001 x 2 raise to 8
Option C:	0. 100001111001 x 2 raise to 9
Option D:	1.00001111001 x 2 raise to 9
5.	In Restoring division Algorithm if A<0 then which of the following is immediate step (Assume M as Dividend Q as Divisor And A as result)
Option A:	Q0 =0
Option B:	A= A +M
Option C:	Q0 =0 & A=A-M
Option D:	Q0 =0 & A=A+M
6.	Which of the following statement is true about D-Flip Flop
Option A:	The output is Complement of Input
Option B:	The output continues to remain in previous state

Option C:	The output Follows the D-Input
Option D:	The output is always high irrespective of D-input
7.	Identify which of the following is not a valid Addressing Mode
Option A:	Register Addressing mode
Option B:	Direct Addressing mode
Option C:	Register Opcode Addressing mode
Option D:	Stack Addressing Mode
8.	State table method is the method for designing
Option A:	Microprogram Control unit
Option B:	Hardwired Control Unit
Option C:	Memory Unit
Option D:	I/O devices
9.	Basic task for control unit is
Option A:	to perform logical operations
Option B:	to perform execution
Option C:	to initiate the resources
Option D:	to decode instructions and generate control signal
10.	The micro instruction MAR<--PC is executed to
Option A:	fetch the data
Option B:	fetch the instruction
Option C:	Fetch both data and instruction
Option D:	Send control signals
11.	In micro programmed control unit, micro instructions are stored in special memory called
Option A:	Control Memory
Option B:	RAM
Option C:	ROM
Option D:	Micro memory
12.	Which of the following is not a key characteristics of memory devices or memory system
Option A:	Location
Option B:	Physical Characteristics
Option C:	Availability
Option D:	Access Method
13.	Which is not true about Register memory
Option A:	fastest possible access
Option B:	only hundreds of bytes in size
Option C:	Very Large in Capacity
Option D:	Part of the processor
14.	Cache memory is implemented using
Option A:	Dynamic RAM
Option B:	Static RAM

Option C:	EPROM
Option D:	PROM
15.	The correspondence between the main memory blocks and those in the cache is given by __________.
Option A:	Mapping function
Option B:	Hash function
Option C:	Locale function
Option D:	Assign function
16.	In a Pipelined Processing System The Instruction $A \leftarrow 3 + A$ $B \leftarrow 4 \times A$ Leads _____________ Hazard
Option A:	Resource Hazard
Option B:	Structural Hazard
Option C:	Data Hazard
Option D:	Branch Hazard
17.	In Instruction Pipelining Structural Hazard means
Option A:	any condition in which either the source or the destination operands of an instruction are not available at the time expected in the pipeline
Option B:	a delay in the availability of an instruction causes the pipeline to stall
Option C:	the situation when two instructions require the use of a given hardware resource at the same time.
Option D:	When a data gets overwritten by branching
18.	Flynn's taxonomy classifies computer architectures based on
Option A:	the number of instructions that can be executed
Option B:	how they operate on data.
Option C:	the number of instructions that can be executed and how they operate on data.
Option D:	The number of Control Signals Generated
19.	Identify the Type of Flynn's Classification of Parallel Processing shown below 
Option A:	SISD
Option B:	SIMD
Option C:	MISD
Option D:	MIMD
20.	We can expand the processor bus connection by using
Option A:	SCSI bus
Option B:	PCI bus
Option C:	Controllers
Option D:	Multiple bus

Q2 **(20 Marks)**	**Solve any Four out of Six (5 marks each)**
A	Differentiate between Computer Organization and Architecture with a example
B	Explain any five addressing Modes with examples
C	Define Instruction cycle. Explain it with a detailed state diagram.
D	Explain Hardwired control unit design method (state table method)
E	Differentiate between Hardwired control unit and Micro programmed control unit
F	Explain the different types of Bus Arbitration methods.

Q3. **(20 Marks)**	**Solve any Two Questions out of Three (10 marks each)**
A	Consider a Cache memory of 16 words. Each block consists of 4 words. Size of the main memory is 128 bytes. Draw the Associative Mapping and Calculate the TAG and WORD size.
B	Draw the flowchart of Restoring Division Algorithm & perform 7 / 3 using this Algorithm
C	Write short note on Flynn’s classification

University of Mumbai

Examination 2020 under cluster __ (Lead College: _________)

Examinations Commencing from 15^{th} June to 26^{th} June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: CSC305 and Course Name: Computer Graphics

Time: 2 hour Max. Marks: 80

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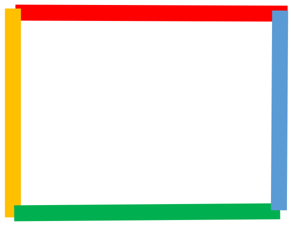
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The gray level value of all pixels is stored in computers in the form of an array, this array is called as
Option A:	Frame Buffer
Option B:	Aspect Ratio
Option C:	Monitor
Option D:	Display Area
2.	In DDA line drawing algorithm, if slope of the line is less than or equal to one, then coordinates of the next successive pixel along the line path is obtained by
Option A:	Taking unit steps along the x direction and y direction
Option B:	Adding slope value to the previous x and y coordinate value respectively
Option C:	Taking unit steps along the x direction value and adding slope value to the previous y coordinate
Option D:	Adding slope value to the previous x coordinate value and taking unit steps along y direction
3.	The initial decision parameter value for Bresenham's line drawing algorithm is obtained by using the equation
Option A:	$P_0 = 2 \nabla y – 2 \nabla x$
Option B:	$P_0 = \nabla y - \nabla x$
Option C:	$P_0 = 2 \nabla y - \nabla x + 3$
Option D:	$P_0 = 2 \nabla y - \nabla x$
4.	Zig Zag appearance of the line is the example of
Option A:	Antialiasing
Option B:	High Resolution
Option C:	Polygon Rendering
Option D:	Aliasing
5.	To find the position of point with respect to polygon boundary --------- is used
Option A:	Aliasing
Option B:	Antialiasing
Option C:	Vector and Raster
Option D:	Inside - Outside Test
6.	The midpoint ellipse drawing algorithm uses ----------- to find the pixel points along the ellipse path
Option A:	8-way symmetry

Option B:	4-way symmetry
Option C:	2- way symmetry
Option D:	6 – way symmetry
7.	In ---------------- display, electronic beam is moved all over the screen one scan line at a time
Option A:	Raster Scan Display
Option B:	Random Scan Display
Option C:	Scanner
Option D:	Pen Plotter
8.	The positive values of ‘θ’ gives
Option A:	Anticlockwise Rotation
Option B:	Clockwise Rotation
Option C:	Shearing Transformation
Option D:	Reflection
9.	When the 2D point (x, y) is reflected about the line y=x then new coordinates of the point are given by
Option A:	(-x, -y)
Option B:	(x, -y)
Option C:	(y, x)
Option D:	(-x, -y)
10.	The X-Shear transformation for the point p(x, y) with xshear parameter value shx and yshear parameter value shy is given by
Option A:	$x^1 = x + y.shx$ $y^1 = y$
Option B:	$x^1 = x$ $y^1 = x. shy + y$
Option C:	$x^1 = x + y.shx$ $y^1 = x. shy + y$
Option D:	$x^1 = x$ $y^1 = y$
11.	In Cohen Sutherland line clipping algorithm, if bit code for both the endpoints are nonzero then
Option A:	Line is completely visible
Option B:	Line is completely invisible
Option C:	Line is partially visible
Option D:	Line is the clipping candidate
12.	Concave polygons are correctly clipped by
Option A:	Sutherland Hodgeman Polygon clipping algorithm
Option B:	Cohen Sutherland line clipping algorithm
Option C:	Weiler Atherton polygon clipping algorithm
Option D:	Liang Barsky line clipping algorithm
13.	In 2D- viewing device independent units are called as
Option A:	World coordinates
Option B:	Physical device coordinates

Option C:	Normalized coordinates
Option D:	Viewport coordinates
14.	In 3 D scaling, scaling factors Sx, Sy, Sz are ------------- in to the original coordinates of the polygon
Option A:	Added
Option B:	Subtracted
Option C:	Multiplied
Option D:	Divided
15.	The objects which are away from the viewer appears small in size and objects which are closer to the viewer appears larger in size, this property of an object is preserved by
Option A:	Perspective Projection
Option B:	Parallel Projection
Option C:	2D clipping
Option D:	Workstation transformation
16.	In Bezier curve
Option A:	The degree of the polynomial defining the curve segment is one greater that the number of defining polygon point
Option B:	The degree of the polynomial defining the curve segment is one less that the number of defining polygon point
Option C:	The degree of the polynomial defining the curve segment is equal to the number of defining polygon point
Option D:	The degree of the polynomial defining the curve segment is always even
17.	The Koch curve is called as fractals because
Option A:	Fractal dimension of Koch curve is less than its topological dimension
Option B:	Fractal dimension of Koch curve is zero
Option C:	Fractal dimension of Koch curve is -1
Option D:	Fractal dimension of Koch curve is greater than its topological dimension
18.	From the following options which shape is not called as fractals
Option A:	Circle
Option B:	Trees
Option C:	Mountains
Option D:	Koch curve
19.	----------------algorithm is used to detect the visible surfaces and remove hidden surfaces
Option A:	Boundary Fill algorithm
Option B:	Liang Barsky algorithm
Option C:	Bresenham’s algorithm
Option D:	Z buffer algorithm
20.	In ---------------------- figures are manipulated to appear as moving images
Option A:	Translation
Option B:	Rotation
Option C:	Animation
Option D:	Reflection

Q2. **(20 Marks Each)**	
A	**Solve any Two** **5 marks each**
i.	Rasterize the line segment using Bresenham's line drawing algorithm. The two endpoint coordinates of the line segment are P1(1,1) and P2(4,3)
ii.	Apply Xshear and Yshear transformation to the square with coordinates A(0,0) , B(2,0), C(2,2) and D(0, 2), xshear parameter value and yshear parameter value is 1
iii.	Define the following terms with example a) Aspect Ratio b) Scan Conversion
B	**Solve any One** **10 marks each**
i.	Clip the line segment using Cohen Sutherland Line clipping Algorithm, The Coordinates of the line segment are P1(1, 1) and P2(11, 8) and coordinates of the window boundaries are (Xwmin, Ywmin) = (3, 3) and (Xwmax, Ywmax) = (8, 7)
ii.	 Develop function/procedure to fill colour in to the above polygon using 8 connected approach.

Q3. **(20 Marks Each)**	
A	**Solve any Two** **5 marks each**
i.	Derive 2- D composite transformation matrix to reflect the point (x, y) about the fixed point (Xp, Yp)(point other than the origin)
ii.	What is visible surface detection? Explain Z buffer algorithm with example
iii.	What is an Animation? Explain traditional animation techniques
B	**Solve any One** **10 marks each**
i.	Differentiate between parallel and perspective projection. Derive the homogeneous transformation matrix for parallel projection
ii.	Construct the Bezier curve of order 3 and 4 polygon vertices P1(3,3), P2(4,5), P3(6, 5), P4(8, 6)

University of Mumbai

Examination 2020 under cluster __ (Lead College: _________)

Examinations Commencing from 15th June to 26th June 2021

Program: **Computer Engineering**

Curriculum Scheme: Rev2019

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

Course Code: CSC305 and Course Name: Computer Graphics

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is not included in computer graphics
Option A:	A single image stored on computer
Option B:	Multiple images stored on computer
Option C:	A video file stored on computer
Option D:	An audio file stored on computer
2.	In DDA line drawing method, for lines having positive slope greater than 1 and taking right end point as starting point, the X and Y coordinate increments are
Option A:	1 and m
Option B:	1/m and 1
Option C:	-1/m and -1
Option D:	-1 and –m
3.	Which of the following line drawing method uses swapping of two terms I) DDA line method II) II)Bresenham's line method
Option A:	Only I
Option B:	Only II
Option C:	Both I and II
Option D:	Neither I nor II
4.	Due to aliasing effect the line appears
Option A:	Straight
Option B:	Curved
Option C:	Zigzag
Option D:	Clipped
5.	In ellipse, at the boundary of region 1 and region 2, the slope of tangent is
Option A:	-1
Option B:	1
Option C:	0
Option D:	∞
6.	What is the last point computed in quadrant 1 on the circumference of an ellipse centered at (10,10) with Rx = 10 and Ry = 20, using midpoint ellipse method
Option A:	(10,0)

Option B:	(20,0)
Option C:	(10,20)
Option D:	(20,10)
7.	Which of the following transformations when performed in succession are additive in nature I) Translation II) Rotation III) Scaling
Option A:	I and II
Option B:	II and III
Option C:	I and III
Option D:	I, II and III
8.	Transformation used for zooming in computer graphics is
Option A:	Translation
Option B:	Rotation
Option C:	Scaling
Option D:	Reflection
9.	In window to viewport mapping, which of the following transformations are used I) Translation II) Rotation III) Scaling
Option A:	I, II and III
Option B:	1 and II
Option C:	II and III
Option D:	I and III
10.	All the points, lines, polygons that are clipped are mapped onto ______ for display.
Option A:	Window
Option B:	Viewport
Option C:	Display area
Option D:	Clipping window
11.	The coordinates of clipping window are (4,4) and (9,8). The region code of point (12,9) is
Option A:	0010
Option B:	1010
Option C:	1000
Option D:	0100
12.	In Liang Barsky line clipping method, the parameter p for left boundary is
Option A:	$-(x_2 - x_1)$
Option B:	$(x_2 - x_1)$
Option C:	$-(y_2 - y_1)$
Option D:	$(y_2 - y_1)$
13.	3D reflection matrix are given about

Option A:	One principle plane
Option B:	Two principle plane
Option C:	Three principle plane
Option D:	Four principle plane
14.	Inverse translation produces the translation in the
Option A:	Same direction
Option B:	Direction of -X axis
Option C:	Direction of -Y axis
Option D:	Opposite direction
15.	Following matrix represents $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\theta & \sin\theta & 0 \\ 0 & -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$
Option A:	3D reflection about Y axis
Option B:	3D rotation about Y axis
Option C:	3D rotation about X axis
Option D:	3D reflection about X axis
16.	As the number of pixels on the screen is increased, it improves
Option A:	Aspect ratio
Option B:	Image size
Option C:	Resolution
Option D:	Window size
17.	Any line that has 1 in the same bit position, in the region codes of each end point is
Option A:	Completely inside
Option B:	Completely outside
Option C:	Partially inside
Option D:	Cannot comment on visibility of line
18.	When scaling transformation with $S_x = 2$ and $S_y = 2$ is applied to a point, then there is a change in its
Option A:	Shape
Option B:	Size
Option C:	Position
Option D:	Orientation
19.	In depth buffer method, when z < depth of (x,y) then z value is
Option A:	stored in visible buffer
Option B:	Stored in depth buffer
Option C:	Stored in refresh buffer
Option D:	Stored in intensity buffer
20.	Image space methods deal with
Option A:	Pixels

Option B:	Lines
Option C:	Surfaces
Option D:	Curves

Q2	
A	**Solve any Two** **5 marks each**
i.	Define computer graphics and give its application areas.
ii.	Define animation and discuss traditional animation techniques
iii.	Explain homogeneous coordinates in computer graphics
B	**Solve any One** **10 marks each**
i.	Derive the mid point ellipse drawing algorithm
ii.	Find the clipping coordinates to clip the line segment AB against the window using Liang Barsky line clipping algorithm. A(20,50) B(80,110) $X_{wmin} = 40$ $Y_{wmin} = 40$ $X_{wmax} = 100$ $Y_{wmax} = 90$

Q3	
A	**Solve any Two** **5 marks each**
i.	What is aliasing effect? Discuss any one antialiasing technique.
ii.	Explain with suitable diagram window to viewport transformation
iii.	A rectangle ABCD with coordinates A(2,2), B(4,2), C(4,4) and D(2,4). Translate the given rectangle 20 units in X direction and 10 units in Y direction. Calculate the new co-ordinates of rectangle ABCD.
B	**Solve any One** **10 marks each**
i.	Calculate pixel positions along a straight line between A(20,20) and B(10,12) using Bresenham's line drawing method
ii.	Explain Z buffer algorithm with suitable diagram