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

University of Mumbai

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

Examinations Commencing from 7th January 2021 to 20th January 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

==========

Subjective/Descriptive questions

Q2. 20 M	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? Solution: let V be the set of households with a VCR. Let C be the set of households with a CD player. Let T be the set of households with cable TV. The question is asking for $\|V \cup C \cup T\|$. By inclusion-exclusion, that is equal to $$\|V\| + \|C\| + \|T\| - \|V \cap C\| - \|V \cap T\| - \|C \cap T\| + \|V \cap C \cap T\|$$ Therefore, $$\|V \cup C \cup T\| = 40 + 60 + 50 - 25 - 30 - 35 + 10 = 70$$
B	Example: Prove by mathematical induction that for all positive integers n $$1 + 2 + 3 + \ldots + n = n(n+1)/2$$ Solution: 1) For $n = 1$, we have $1 = 1 \cdot (1+1)/2 = 1$, therefore $P(1)$ holds, 2) Assume that the statement is true for a particular value $n = k$, that is $$1 + 2 + 3 + \ldots + k = k(k+1)/2$$ 3) Prove that the sum is true for $n = k+1$, that is $$1 + 2 + 3 + \ldots + (k+1) = (k+1)(k+2)/2$$ If, to the left and right side of the equality 2) we add $k+1$ increased is given series by next term $$1 + 2 + 3 + \ldots + k + (k+1) = k(k+1)/2 + (k+1) = [k(k+1) + 2(k+1)]/2 = (k+1)(k+2)/2$$ therefore, the given statement is true for all positive integers.
C	Let D_{30} be the divisors of 30. Draw the Hasse diagram for $(D_{30}, \|)$, where "|" represents the divisibility relation.

University of Mumbai

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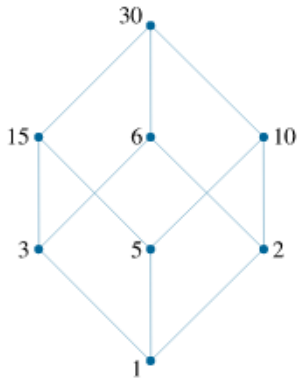
Subjective/Descriptive questions

	Solution. The divisors of the number 30 are given by the set $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$. To draw the Hasse diagram, we start with the minimal element 1 at the bottom. On the first level we place the prime numbers 2, 3, and 5. On the second level we put the numbers 6, 10, and 15 since they are immediate successors for the corresponding numbers at lower level. The number 30 should be placed at higher level than 6, 15, and 10. We then connect all elements with their immediate successors. The resulting Hasse diagram is shown in Figure 8. 
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. Solution: Let a , b and c are any three integers. Closure property: Now, a * b = maximum of (a, b) $\in$ Z for all a,b $\in$ Z Associativity : (a * b) * c = maximum of {a,b,c} = a * (b * c) $\therefore$ (Z, *) is a semi group. Identity : There is no integer x such that a * x = maximum of (a, x) = a for all a $\in$ Z $\therefore$ Identity element does not exist. Hence, (Z, *) is not a monoid.
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? A four digit code could be anything between 0000 to 9999, hence there are 10,000 combinations if every digit could be used more than one time but since we are told in the question that one digit only may be used once it limits our number of combinations. In order to determine the correct number of permutations we simply plug in our values into our formula: P(n,r)=10!/ (10−4)!=(10·9·8·7·6·5·4·3·2·1)/(6·5·4·3·2·1)=5040

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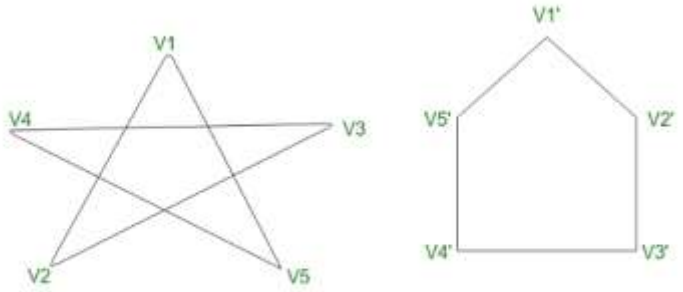
Subjective/Descriptive questions

F	Consider the following two graphs -  G G' Are Two graphs Isomorphic? **Solution :** Let f be a bijective function from V to V'. Let the correspondence between the graphs be- $v1' = f(v1)$ $v2' = f(v5)$ $v3' = f(v3)$ $v4' = f(v4)$ $v5' = f(v2)$ The above correspondence preserves adjacency as- $v1$ is adjacent to $v2$ and $v3$ in G, and $f(v1) = v1'$ is adjacent to $f(v2) = v5$ and $f(v3) = v3$ in G' Similarly, it can be shown that the adjacency is preserved for all vertices. Hence, G and G' are isomorphic.

Q3. 20M	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.

University of Mumbai

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Subjective/Descriptive questions

<table>
<tr><td></td><td>

ANSWER

Given that $f(x) = \cos x$ and $g(x) = 3x^2$

Given $f : R \to R$ and $g : R \to R$,

$\therefore f \circ g : R \to R$ and $g \circ f : R \to R$

$f \circ g(x) = f(g(x)) = f(3x^2) = \cos(3x^2)$

$g \circ f(x) = g(f(x)) = g(\cos x) = 3\cos^2 x$

Since $\cos(3x^2) \neq 3\cos^2 x$.

$\therefore g \circ f \neq f \circ g$

</td></tr>
<tr><td>B</td><td>

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

Solution
(i).Table for the operation * for n=4

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

The set isclosed under the operation *z because for any a,b,∈ zn

(a*b)∈ zn

(a*4 b) *4 c=a *4 (b *4 c)

Let a=1; b=2; c=3
(1*4 2) *4 3=1*4 (2*4 3)
2*4 3 = 1*4 (2)
2=2
Is associative operation
From above deduction;(z,*) is semigroup.

</td></tr>
</table>

University of Mumbai

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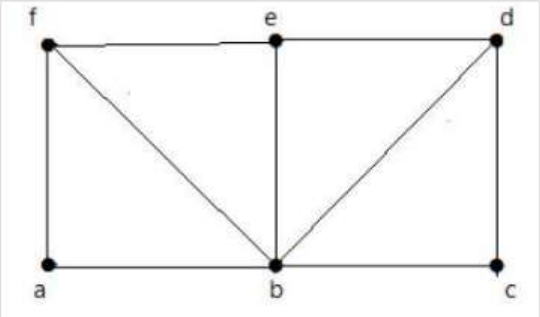
Examination: SE Semester III

Course Code: CSC303 and Course Name: Discrete Mathematics

Time: 2 hour Max. Marks: 80

==========

Subjective/Descriptive questions

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  For the graph shown above – ▪ Euler path exists – false ▪ Euler circuit exists – false ▪ Hamiltonian cycle exists – true ▪ Hamiltonian path exists – true
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. Solution:- R is equivalence relation; therefore R is reflexive,symmetric and transitive. Let a,b,c be any three elements By data if aRb and aRc => bRc Putting c=a; weget; aRb and aRa => bRa but by reflexive; aRa istrue if aRb; then bRa therefore S is symmetric if aRb and aRc then bRc since R is symmetric if aRb, then bRa bRa and aRc give bRc therefore S is transitive

University of Mumbai

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

Examinations Commencing from 7th January 2021 to 20th January 2021

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Course Code: CSC303 and Course Name: Discrete Mathematics

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==========

Subjective/Descriptive questions

	S is reflexive,symmetric and transitive Therefore S is equivalence relation.
E	Find the complete solution of the recurrence relation $a_n + 2a_{n-1} = n + 3$ for $n \geq 1$ and with $a_0 = 3$ Solution $B = \frac{16}{9}$ Required solution:- $a_n = \frac{16}{9}(-2)^n + \frac{n}{3} + \frac{11}{9}$
F	Use the laws of logic to show that [(p→q)^~q]→~p is a tautology Solution:- LHS:-[(p→q)^~q]→~p ~[(p→q)^~q]v~p ……..[p→q=~pvq] ~[(~p v q)^~q]v~p ……..[p→q=~pvq] ~[(~p∧~q)v(q∧~q]v~p ……..[distributive] ~[(~p∧~q)vF]v~p ……..[p∧~p=F] ~[(~p∧~q)]v~p ……..[p∧F=p] [~(~p)∧~(~q)]v~p ……..[~(p∩q)=~pv~q] [pvq]v~p ……..~(~p)= p (pv~p)vq ……..[associative] Tvq ……..[pv~p=T] T [(p→q)^~q]→~p Is a tautology

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

==========

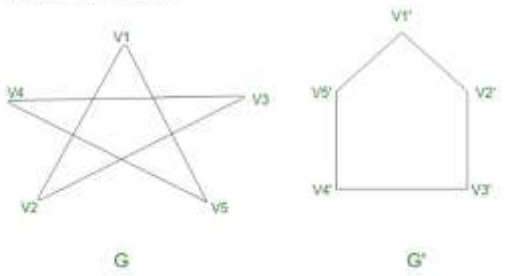
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Power set of empty set has exactly _____ subset.
Option A:	One
Option B:	Two
Option C:	Three
Option D:	Zero
2.	The compound propositions p and q are called logically equivalent if _____ 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

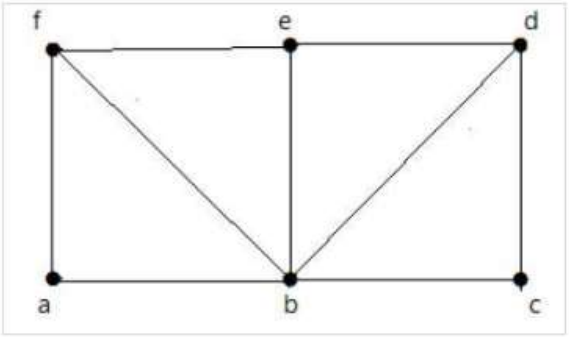
7.	A directed graph or digraph can have directed cycle in which _____
Option A:	starting node and ending node are different
Option B:	starting node and ending node are same
Option C:	minimum four vertices can be there
Option D:	ending node does not exist
8.	What is a complete digraph?
Option A:	connection 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 IV (Lead College: PCE)

Examinations Commencing from 15th June 2021 to 26th June2021

Program: **Computer**

Curriculum Scheme: Rev2016

Examination: TE Semester III

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

Time: 2 hour Max. Marks: 80

==========

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

QNo2A(i) Step 1 : find out number of parity bits and data bits-----1m

Step 2 : Check the parity bits , While checking the parity, if the total number of 1's are odd then write the value of parity bit **P1**(or **P2** etc.) as **1** (which means the error is there) and if it is even then the value of parity bit is **0** (which means no error).-------2m

Step3: Findout the error bit, For this example its 5^{th} bit.-----1m

Step 4: Correct the 5^{th} bit------1m

(ii). Step 1 : Expand the expression ----1m

Step2: Apply the Boolean rules-------3m

Step 3 : Simplify and write the expression ----1m

QNo2B: Step 1 − Arrange the given min terms in an **ascending order** and make the groups based on the number of ones present in their binary representations. So, there will be **at most 'n+1' groups** if there are 'n' Boolean variables in a Boolean function or 'n' bits in the binary equivalent of min terms. ------2m

Step 2 − Compare the min terms present in **successive groups**. If there is a change in only one-bit position, then take the pair of those two min terms. Place this symbol '_' in the differed bit position and keep the remaining bits as it is.-----2m

Step 3 − Repeat step2 with newly formed terms till we get all **prime implicants**.-----1m

Step 4 − Formulate the **prime implicant table**. It consists of set of rows and columns. Prime implicants can be placed in row wise and min terms can be placed in column wise. Place '1' in the cells corresponding to the min terms that are covered in each prime implicant.-------2m

Step 5 − Find the essential prime implicants by observing each column. If the min term is covered only by one prime implicant, then it is **essential prime implicant**. Those essential prime implicants will be part of the simplified Boolean function.------1m

Step 6 − Reduce the prime implicant table by removing the row of each essential prime implicant and the columns corresponding to the min terms that are covered in that essential prime implicant. Repeat step 5 for Reduced prime implicant table. Stop this process when all min terms of given Boolean function are over.-------1m

Step 7- Draw the circuit with basic gates---1m

QNo2C(i): Write select lines and data lines-----1m

Write k-map table with input and output-------3m

Draw the circuit diagram-----1m

QNo2C(ii): Find out number of input bits and outputs----1m

Write Truth Table----------2m

Write expression for output----1m

Draw the circuit diagram---1m

Qno 3A:

1. Find number of flip flops required for designing a mod 6 counter----1m
2. Write the Counter table with present state and next state—4m
3. Draw the K map and write the expression-----3m
4. Draw the circuit---2m

Qno 3B:

1. We construct the characteristic table of D flip-flop and excitation table of S-R flip-flop.—2m
2. Using the K-map we find the boolean expression of S and R in terms of D---2m
3. construct the circuit diagram of the conversion of S-R flip-flop into D flip-flop.—1m
4. We construct the characteristic table of JK flip-flop and excitation table of S-R flip-flop.—2m
5. Using the K-map we find the boolean expression of S and R in terms of JK---2m
6. construct the circuit diagram of the conversion of S-R flip-flop into JK flip-flop.—1m

Qno 3B(i):

1. Identify the input and output variables-
   - Input variables = A, B, B_{in} (either 0 or 1)
   - Output variables = D, B_{out} where D = Difference and B_{out} = Borrow------1m
2. Draw the truth table- 2m
3. Draw K-maps using the above truth table and determine the simplified Boolean expressions-1m
4. Draw the logic diagram.---1m

Qno 3B(ii):

Three type of Modeling Style in VHDL -

Data Flow Modeling Style.

Structural Modeling Style.

Behavior Modeling Style.

Data Flow Modeling Style - Data Flow Modeling Style Shows that how the data / signal flows from input to ouput threw the registers / Components.

Behavior Modeling Style : In this modeling style, the behavior of an entity as set of statements is executed sequentially in the specified order. Only statements placed inside a PROCESS, FUNCTION, or PROCEDURE are sequential.

PROCESSES, FUNCTIONS, and PROCEDURES are the only sections of code that are executed sequentially.

However, as a whole, any of these blocks is still concurrent with any other statements placed outside it.

One important aspect of behavior code is that it is not limited to sequential logic. Indeed, with it, we can build sequential circuits as well as combinational circuits.

The behavior statements are IF, WAIT, CASE, and LOOP. VARIABLES are also restricted and they are supposed to be used in sequential code only. VARIABLE can never be global, so its value cannot be passed out directly.

Structural Modeling Style:

In this modeling, an entity is described as a set of interconnected components. A component instantiation statement is a concurrent statement. Therefore, the order of these statements is not important. The structural style of modeling describes only an interconnection of components (viewed as black boxes), without implying any behavior of the components themselves nor of the entity that they collectively represent.

In Structural modeling, architecture body is composed of two parts − the declarative part (before the keyword begin) and the statement part (after the keyword begin).

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

==========

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

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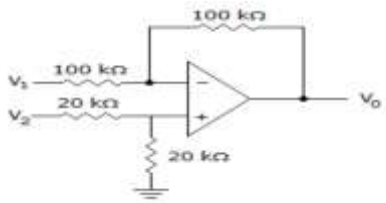
Q1. (40 marks)	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Amplifiers and oscillators using BJT, operate in which of the following region?
Option A:	Inverted mode
Option B:	Active
Option C:	Cut off
Option D:	Saturation
2.	Which operating 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

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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

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

University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

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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

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 $\left\{\left(\frac{1}{3}\right)^{\lvert k\rvert}\right\}$
E	Obtain the half range cosine series expansion of $f(x) = x(\pi - x), 0 < x < \pi$.
F	Calculate Spearman'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 $Z^{-1}\left\{\frac{1}{z-1}\right\}$, $\|z\| < 1$.
E	Fit a straight line to the following data, with x as independent variable
F	Using Laplace Transform solve $(D^2 - 3D + 2)y = 4e^{2t}$, with $y(0) = -3$ and $y'(0) = 5$.

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