

Duration: 1 Hour

Note: Answer any **One** full question from **each Unit**.

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	Unit – I	Marks	BT*	CO*	PO*
1.	<p>a) Let $U = \{1, 2, 3, 4, 6, 8, 10, 12, 15, 16\}$, $A = \{x \in U \mid x \text{ is even}\}$, $B = \{x \in U \mid x \text{ is a multiple of 3}\}$. Represent the following using bit strings (Use only bit string operations).</p> <p>(i) $B \cup A$ (ii) $A \cap B$.</p> <p>b) Justify with suitable reasons whether the relation R defined on $A = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ is an equivalence relation, where aRb if and only if a and b yield the same remainder when divided by 5.</p> <p>c) Let $A = \{a, b, c, d\}$ and $R = \{(a, b), (b, a), (b, b), (c, a), (d, c)\}$. Find the transitive closure of the relation R by using Warshall's algorithm.</p>	2	L*1	1	2
2.	<p>a) Encode the message "THE TRUCK ARRIVES TONIGHT" using the key word "ZEBRA" by using keyword columnar transposition.</p> <p>b) Let $A = \{a, b, c, d, e, f, g, h\}$. Let $p = (a, f, g, h)$ and $q = (b, c, d, g)$. Compute each of the following and write the result as the product of disjoint cycles.</p> <p>(i) $p \circ p$ (ii) $p \circ q^{-1}$ (iii) $p^{-1} \circ q^{-1}$</p> <p>c) Let $A = \{1, 2, 3, 4, 5\}$. Consider the relation R on A defined by aRb if and only if $a - b \leq 2$.</p> <p>(i) Find the relation R.</p> <p>(ii) Find the matrix of R and draw the digraph of R.</p> <p>(iii) Find in degree and out degree of each element of A.</p>	2	L1	1	2
	<p>(i) Find the relation R.</p> <p>(ii) Find the matrix of R and draw the digraph of R.</p> <p>(iii) Find in degree and out degree of each element of A.</p>	4	L3	1	1
	<p>(i) Find the relation R.</p> <p>(ii) Find the matrix of R and draw the digraph of R.</p> <p>(iii) Find in degree and out degree of each element of A.</p>	4	L2	1	1
Unit – II					
a)	With a neat diagram explain Konigsberg bridge problem.	5	L1	2	2
b)	Write adjacency matrix and incidence matrix of $K_{3,3}$ and C_3 .	5	L3	2	2
a)	<p>i) Define cut vertex and cut edge.</p> <p>ii) Apply suitable rules of inference to establish the validity of the following arguments,</p> $\begin{array}{l} p \wedge q \\ p \rightarrow (r \wedge q) \\ r \rightarrow (s \vee t) \\ \neg s \\ \hline \therefore t \end{array}$	6	L3	2	2
b)	Define bipartite graph and degree of vertex in a graph. Give examples.	4	L1	2	2

* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations - I, February 2024

EC1002-2 – APPLIED DIGITAL LOGIC DESIGN
(For ACT, EC, EE, VLSI)

Duration: 1 Hour

Max. Ma

Note: Answer any **One** full question from **each Unit**.

Unit – I

Marks

BT* C

1. a) Perform the code conversion for the following and show each steps clearly.

i) $12.6532_{(10)} = (?)_2$

ii) $110100111100.0101_{(2)} = (?)_{10}$

iii) $CF.52_{(16)} = (?)_{10}$

5

L*3

- b) Prove the following identity and also verify using truth table.

$$(a + b)(\bar{a}\bar{c} + c)(\bar{b} + ac) = \bar{a}b$$

5

L3

2. a) Design a combinational logic circuit with inputs P, Q, R so that output S is high whenever P is zero or whenever Q=R=1

5

L3

- b) Using K-Map, find Minimal Sum expression for the following switching function.

$$f(a, b, c, d) = \sum m(0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$$

5

L3

Unit – II

3. a) Realize the EX-OR and EX-NOR gate using basic gates.

5

L3

- b) Using K-Map, find Minimal Sum expression for the following switching functions.

i) $f(a, b, c) = \sum m(0, 2, 4, 6)$

ii) $f(a, b, c) = \sum m(0, 2, 3, 4, 5, 7)$

5

L3

4. a) Convert the following equations into their requested canonical form

i) $X(A, B, C) = \bar{A}B + BC$ (SOP)

ii) $P(W, X, Y, Z) = (\bar{W} + X)(Y + \bar{Z})$ (POS)

5

L3

- b) Develop a truth table for a system which accepts two 2-bit binary numbers and generate three outputs. The first output indicates when the 2 numbers differ by 2 or more; the second output indicates when the two numbers are identical and third output indicates when the first number exceeds the 2nd number.

5

L3

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome



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NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations - I, February 2024

CS1005-1 – INTRODUCTION TO PYTHON PROGRAMMING
(For BT, ME)

Duration: 1 Hour

Max. Marks: 20

Note: Answer any **One** full question from **each Unit**.

Unit – I		Marks	BT*	CO*	PO*
1.	a) Explain the different classification of Computer.	5	L*2	1	1
	b) Write a Python program to find largest of 3 numbers using if elif ladder.	5	L3	2	1
2.	a) List the different types of operators. Explain any two operators with an example program.	5	L2	1	1
	b) Write an algorithm and flowchart to check the number is +ve, -ve or zero.	5	L3	2	1
Unit – II					
3.	a) Describe the various steps involved in program development with a neat diagram.	5	L2	1	1
	b) Write a python program to check the given number is palindrome or not.	5	L3	2	2
4.	a) List the differences between Primary memory and Secondary memory.	5	L2	1	1
	b) Write the general syntax of <i>while</i> and <i>for</i> loop, explain with example programs.	5	L3	2	2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)
II Sem B.Tech. (CBCS) Mid-Semester Examinations - I, Feb

EC1002-1 – APPLIED DIGITAL LOGIC DESIGN

Duration: 1 Hour

Note: Answer any One full question from each Unit.

Unit – I

Marks

1. a) Express the Boolean function $F(A, B, C) = A + \bar{B}C$ as a sum of minterms and $F(X, Y, Z) = (X + Y)(\bar{X} + Z)$ as a product of maxterms.
b) State and prove De-Morgan's theorem using the tabular method.
2. a) Perform conversion on the following numbers, clearly showing the steps.
 - i. $(25.625)_{10} = (?)_2$
 - ii. $(42A.12)_{16} = (?)_{10}$
 - iii. $(1011001.0110111)_2 = (?)_{16}$b) Write the difference between Analog and Digital Signals.

Unit – II

3. a) Design a combinational logic circuit so that an output is generated indicating when the majority of four inputs are true.
b) Simplify the given Boolean Expression using the K-map method.

$$Y(A, B, C, D) = \sum m(0, 1, 3, 7, 8, 9, 11, 15)$$

4. a) For the given incompletely specified Boolean function, find the minimal sum.

$$F(a, b, c, d) = \sum m(1, 5, 6, 7, 9, 11, 12, 13) + \sum d(0, 3, 4)$$

- b) Realize the given Boolean expression using NOR gate only with the help of a logic diagram.

$$Y(A, B, C) = A\bar{B} + \bar{A}B + AC$$

BT* Bloom's Taxonomy, L* Level;

CO* Course Outcome;

PO* Program Outcome



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NMAM INSTITUTE OF TECHNOLOGY, NITTE
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II Sem B.Tech. (CBCS) Mid Semester Examinations - I, February 2024

CY1003-1- MATERIALS CHEMISTRY FOR COMPUTER SYSTEMS

(For AD, AM, CB, CC, CS, IS, RI)

Duration: 1 Hour

Max. Marks:

Note: Answer any **One** full question from each Unit.

Unit – I

- | | Marks | BT* | CO* |
|--|-------|-----|-----|
| 1. a) Explain the construction and working of Calomel electrode. | 4 | L*2 | 1 |
| b) Describe the experimental method of determination of pH using glass electrode. | 3 | L2 | 1 |
| c) A concentration cell was constructed by immersing two silver electrodes in 0.036 M and 0.063 M AgNO ₃ solution. Write the cell reaction and calculate the EMF of the cell. | 3 | L3 | 1 |
| 2. a) Describe the construction and working of methanol-oxygen fuel cell. List out any two advantages of methanol as a fuel in fuel cells. | 5 | L2 | 1 |
| b) Write any two differences between battery and fuel cells | 1 | L2 | 1 |
| c) Derive an expression for glass electrode potential. | 4 | L2 | 1 |

Unit – II

- | | | | |
|--|---|----|---|
| 3. a) Describe the construction and working of Li-ion Battery and mention the advantages of lithium metal as an anodic material. | 5 | L2 | 1 |
| b) Discuss the theory of conductometric estimation and explain its application in strong acid vs strong base titration | 5 | L2 | 1 |
| 4. a) Explain the construction and working of Na-ion battery. Mention any two applications of it. | 5 | L2 | 1 |
| b) Define degree of polymerization. In a sample of a polymer, 23% molecules have molecular mass 14765 g/mol, 34% molecules have molecular mass 26453 g/mol, and remaining molecules have molecular mass 16879g/mol, calculate the number average and weight average molecular mass of the polymer. | 5 | L3 | |

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

NMAM INSTITUTE OF TECHNOLOGY, NITTE

Off-Campus Centre of Nitte (Deemed to be University)

II Sem B.Tech (CBCS) Mid Semester Examinations - I, February 2024

MA1007-1- DISCRETE MATHEMATICS AND TRANSFORM TECHNIQUES

(For AD, AM, CB, CCE, CS, IS, RI)

Max. Marks: 20

Duration: 1 Hour

Note: Answer any One full question from each Unit.

Unit - I

- | | Marks | BT* | CO* | PO* |
|---|-------|-----|-----|-----|
| 1. a) (i) Show that the statement $p \leftrightarrow q$ is logically equivalent to the statement $((p \rightarrow q) \wedge (q \rightarrow p))$ by using truth table.
(ii) Show that $\neg(p \leftrightarrow q)$ is logically equivalent to $(p \vee q) \wedge (\neg p \vee \neg q)$ using logical equivalences (without using truth table). | 6 | L*3 | 1 | 1 |
| b) Let $P(x)$ be the statement " x can speak Russian" and let $Q(x)$ be the statement " x knows the computer language C++." Express each of these sentences in terms of $P(x), Q(x)$, quantifiers, and logical connectives. The domain for quantifiers consists of all students at your school.
i) There is a student at your school who can speak Russian and who knows C++.
ii) There is a student at your school who can speak Russian but who doesn't know C++.
iii) Every student at your school either can speak Russian or knows C++.
iv) No student at your school can speak Russian or knows C++. | 4 | L2 | 1 | 2 |
| 2. a) Write the following argument in symbolic form and then establish the validity of the argument using the rules of inference. "If Dominic goes to the racetrack, then Helen will be mad," "Ralph plays cards all night, only if Carmela gets mad," "If either Helen or Carmela gets mad, then their lawyer Veronica will be notified," "Veronica has not heard from either of these clients," Consequently, "Dominic did not make it to the racetrack and Ralph didn't play cards all night." | 5 | L3 | 1 | 2 |
| b) Show that $\neg \exists x(P(x) \rightarrow Q(x))$ and $\forall x(P(x) \wedge \neg Q(x))$ are logically equivalent. | 3 | L2 | 1 | 2 |
| c) Determine the truth value of these statements, if the domain of each variable consists of all real numbers.
(i) $\exists x (x^2 = -1)$, (ii) $\forall x (x^2 = x)$. | 2 | L2 | 1 | 1 |

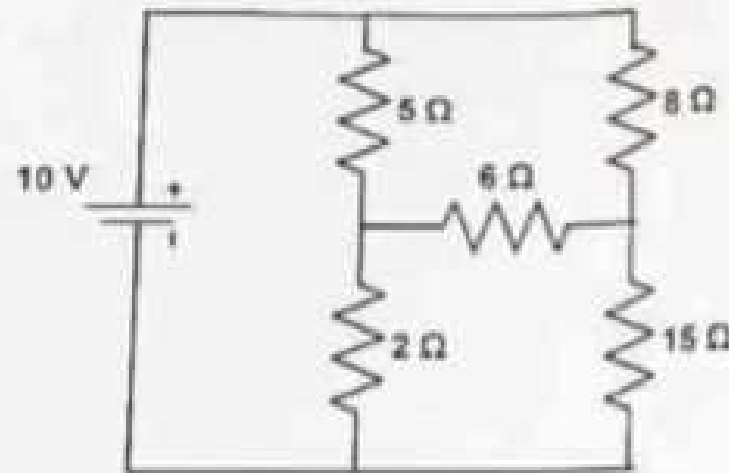
Unit - II

- | | | | | |
|--|---|----|---|---|
| 3. a) Prove that $\sqrt{2}$ is irrational.
b) Determine whether each of the following relation R is reflexive, symmetric or transitive on the set A . Justify your answer.
(i) $A = \mathbb{Z}; aRb$ if and only if $a \leq b + 1$.
(ii) $A = \mathbb{Z}; aRb$ if and only if $a + b$ is even.
(iii) $A = \{1, 2, 3, 4\}; R = \{(1, 1), (1, 2), (1, 3), (3, 1), (3, 3), (3, 2), (1, 4), (4, 2), (3, 4)\}$. | 4 | L2 | 1 | 2 |
| 4. a) Find the least integer n for which the statement is true and prove that $10n < 3^n$.
b) Let $A = \{1, 2, 3, 4, 6, 12\}$, R be a relation on A defined by aRb if and only if b divides a .
(i) Find the relation R .
(ii) Draw the digraph of R .
(iii) Find in-degrees and out-degrees of each vertex.
(iv) Compute the Matrix of R . | 5 | L3 | 1 | 1 |
| | 5 | L2 | 2 | |

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

Unit – I

1. a) Using mesh analysis, determine the value of voltage across $6\ \Omega$ resistor for the circuit shown in FigQ1a.



FigQ1a

- b) Prove the relationship between line and phase quantities in a delta connected 3ϕ system with the help of phasor diagram. Also derive the equation of power in a 3 phase system in terms of line parameters.
- a) Define average value of an alternating sinusoidal waveform. Also derive the expression for the same.

8 L3

8 L4

8 L3

QUESTIONS

Unit – I

	Marks	BT*	CO*	PO*
1. a) Convert the following equations into their requested canonical form				
(i) $X(A, B, C) = \overline{A}B + BC$ (SOP)				
(ii) $P(W, X, Y, Z) = (\overline{W} + X)(Y + \overline{Z})$ (POS)				
(iii) $F(X, Y, Z) = (X + Y)(\overline{X} + Z)$ (POS)				
b) Design a logic circuit that controls the passage of the signal 'A' according to the following requirement	6	L*3	1	1
i) Output 'X' will equal 'A' when control inputs B and C are the same				
ii) 'X' will remain 'HIGH' when B and C are different	6	L4	1	2

Unit – I

1. a) Define the terms with respect to alternating quantity

- Cycle
- Peak to peak value

- b) Using mesh analysis, find the voltage drop across the 3Ω resistor in Fig. 1b

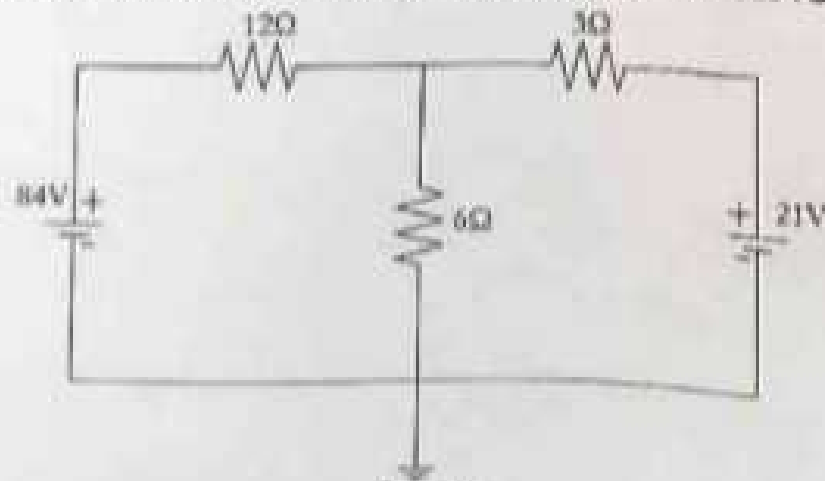


fig. 1b

- c) Show that power consumed by a pure inductive circuit is zero.

Marks BT* CO* PO*

04 L*1 1 1,2

06 L3 1 1,2
06 L2 2 1,2

Unit - I

	Marks	BT*	CO*	PO
1. a) What is an Algorithm? Write an algorithm and flowchart for a program that converts temperature from Celsius to Fahrenheit $F = (C \cdot 9/5) + 32$	5	L*2	1	1.2
b) Write and Explain step by step procedure to display numbers from 1 to 5 using While loop.	6	L2	1	1.2

Unit – I		Marks	BT
1.	<p>a) Simplify the following using Boolean algebra: $(A + B' + C')(A + B' + C)(A + B + C')$.</p> <p>b) Prove De-Morgan's theorems using the truth table approach.</p> <p>c) Minimize the given logic function using the K-map method. $F(A,B,C)=A'BC'+ABC'+ABC$.</p>	<p>6</p> <p>6</p> <p>4</p>	<p>L1</p> <p>L2</p> <p>L3</p>
2.	<p>a) Given the simplified expression of a Boolean function, write the truth table, and minterm list and obtain the given simplified function first by writing the equation in canonical form and then use K-map to simplify. $Y = f(a, b, c) = c'$.</p> <p>b) Use 2's complement method to find: (i) 1101-1001 (ii) 1001-1101.</p> <p>c) Perform the conversion for the following and show each step clearly. (i) $1A2_{16} = (?)_{10}$ (ii) $45.25_{10} = (?)_2$</p>	<p>6</p> <p>6</p> <p>4</p>	<p>L1</p> <p>L1</p> <p>L1</p>
3.	<p>a) A system receives three inputs and generates a one-bit output based on the even number of ones present in the input. If the inputs are completely zeros or if it has an odd number of ones, the output will be zero and if the input has an even number of ones then the output will be set to one. Write the truth table for such a system and represent the simplified function using the logic diagram.</p>	6	L1

Unit – I

1. a) Define average value of an alternating quantity. Derive an expression for average value of an alternating current.
- b) Using mesh analysis, find the current through 15Ω resistor in the circuit shown in Fig: Q1b.

Marks	BT*	CO*
5	L*2	1

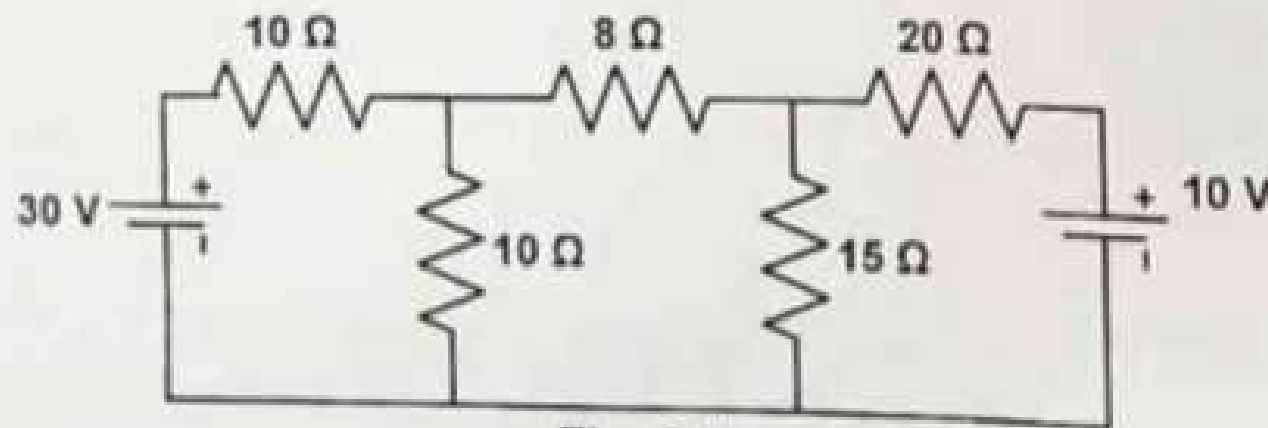


Fig: Q1b

- c) In three-phase circuit two wattmeter used to measure power indicate 1200 W and 1800 W respectively. Find the power factor of the circuit.
2. a) With neat circuit diagram and waveforms derive the relationship between voltage and current in a single-phase RC circuit. Also derive the expression for power consumed.

7	L3	1
4	L2	2
5	L2	2

Duration: 1 Hour

Note: Answer any One full question from each Unit.

Unit – I

Marks BT*

1. a) Define the terms (a) Phase (b) Average value (c) power factor
(d) form factor (e) peak factor
- b) Using nodal analysis, find voltage across 20Ω resistor.

5 L*1

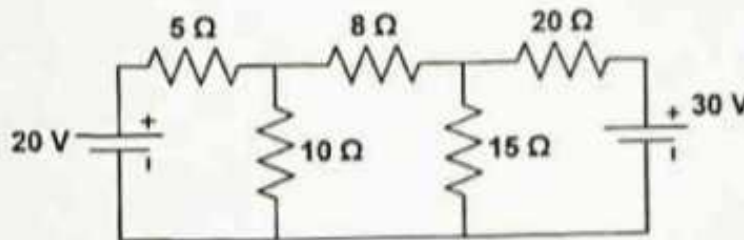


Figure 1b

5 L3

2. a) Define root mean square value of a sinusoidal alternating quantity. Derive an expression for RMS value of a sinusoidal alternating current.
- b) Using mesh analysis, determine the value of voltage across 8Ω resistor for the circuit shown in Figure 2b.

5 L2

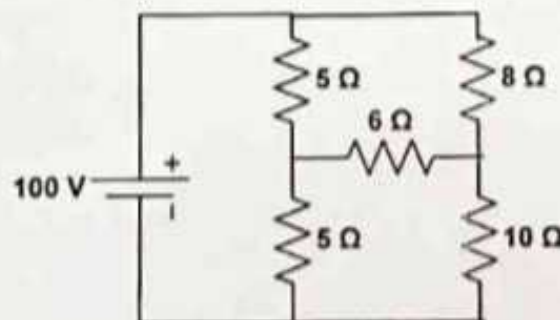


Figure 2b

5 L3

Unit – II

3. a) With neat circuit diagram and waveforms derive the relationship between voltage and current in a series RL circuit. Also derive the expression for the power consumed.
- b) With the help of a vector diagram show that two wattmeters are sufficient to measure the 3-phase power in a star connected load
4. a) Obtain the relationship between line and phase quantities of three phase delta connected load. Also derive the expression for three phase power.
- b) A pure resistance of 50Ω is in series with a capacitance of $100\mu\text{F}$. The series combination is connected across a 100V, 50Hz supply. Find impedance, current, power factor and power consumed by the circuit.

5 L2

5 L2

5 L2

5 L3

NMAM INSTITUTE OF TECHNOLOGY, NITTE

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II Sem B.Tech (CBCS) Mid Semester Examinations - I, February 2024

MA1007-1- DISCRETE MATHEMATICS AND TRANSFORM TECHNIQUES

(For AD, AM, CB, CCE, CS, IS, RI)

Duration: 1 Hour

Max. M

Note: Answer any One full question from each Unit.

Unit – I		Marks	BT*
1. a)	(i) Show that the statement $p \leftrightarrow q$ is logically equivalent to the statement $((p \rightarrow q) \wedge (q \rightarrow p))$ by using truth table. (ii) Show that $\neg(p \leftrightarrow q)$ is logically equivalent to $(p \vee q) \wedge (\neg p \vee \neg q)$ using logical equivalences (without using truth table).	6	L*3
b)	Let $P(x)$ be the statement " x can speak Russian" and let $Q(x)$ be the statement " x knows the computer language C++." Express each of these sentences in terms of $P(x), Q(x)$, quantifiers, and logical connectives. The domain for quantifiers consists of all students at your school. i) There is a student at your school who can speak Russian and who knows C++. ii) There is a student at your school who can speak Russian but who doesn't know C++. iii) Every student at your school either can speak Russian or knows C++. iv) No student at your school can speak Russian or knows C++.	4	L2
2. a)	Write the following argument in symbolic form and then establish the validity of the argument using the rules of inference. "If Dominic goes to the racetrack, then Helen will be mad," "Ralph plays cards all night, only if Carmela gets mad," "If either Helen or Carmela gets mad, then their lawyer Veronica will be notified," "Veronica has not heard from either of these clients," Consequently, "Dominic did not make it to the racetrack and Ralph didn't play cards all night."	5	L3
b)	Show that $\neg \exists x(P(x) \rightarrow Q(x))$ and $\forall x(P(x) \wedge \neg Q(x))$ are logically equivalent.	3	L2
c)	Determine the truth value of these statements, if the domain of each variable consists of all real numbers. (i) $\exists x(x^2 = -1)$, (ii) $\forall x(x^2 = x)$.	2	L2
Unit – II			
3. a)	Prove that $\sqrt{2}$ is irrational.	4	L2
b)	Determine whether each of the following relation R is reflexive, symmetric or transitive on the set A . Justify your answer. (i) $A = \mathbb{Z}$; aRb if and only if $a \leq b + 1$. (ii) $A = \mathbb{Z}$; aRb if and only if $a + b$ is even. (iii) $A = \{1, 2, 3, 4\}$; $R = \{(1, 1), (1, 2), (1, 3), (3, 1), (3, 3), (3, 2), (1, 4), (4, 2), (3, 4)\}$.	6	L3
4. a)	Find the least integer n for which the statement is true and prove that $10n < 3^n$.	5	L3
b)	Let $A = \{1, 2, 3, 4, 6, 12\}$, R be a relation on A defined by aRb if and only if b divides a . (i) Find the relation R . (ii) Draw the digraph of R . (iii) Find in-degrees and out-degrees of each vertex. (iv) Compute the Matrix of R .	5	L2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

Unit – I

- a) With neat diagram, explain the constructional features of three-phase induction motor.
 - b) Derive the equation for average value of sinusoidally varying quantity.
-
- a) With neat diagram, explain the working principle of transformer
 - b) An AC Circuit consists of a pure resistance of $50\ \Omega$ and is connected across an AC supply of 230 V , 50 Hz . Calculate current, power consumed, equation for voltage and current.
 - c) A 250 kVA , $11\ 000\text{ V}/400\text{ V}$, 50 Hz single-phase transformer has 80 turns on the secondary. Calculate:
 - i) the approximate values of the primary and secondary currents;
 - ii) the approximate number of primary turns;
 - iii) the maximum value of the flux.
-
- a) Apply the mesh analysis method to the network of Figure Q3(a), find Power absorbed by $4\ \Omega$ resistor.

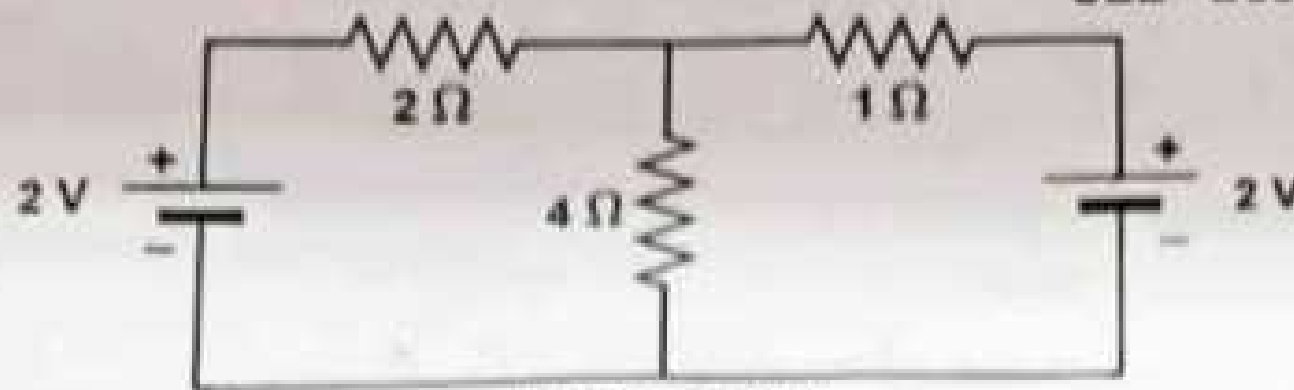


Figure Q3(a)

- b) Derive the equation for torque developed in the armature of a DC motor. 04
- c) With neat diagram, explain the construction of core type single phase transformer. 06

1. a) Perform number conversion of the given numbers.

i) $345_{10} = (?)_2$

ii) $10110.011_2 = (?)_{10}$

iii) $AB24.C5_{16} = (?)_{10}$

5 L3 1

b) Implement the given function using basic gates, NAND only and NOR only. $Y=f(a, b, c) = a+b'+bc$

5 L3 2

c) Design a combinational circuit having four inputs (a, b, c, d) and one output (Y). Indicate logic 1 at the output when majority of its inputs are logic 1, indicate logic 0 when majority of its input are logic 0. Output is not specified when number of 1's and 0's, are equal at the input.

6 L3 2

2. a) Design a combinational logic circuit with inputs P, Q, R so that output S is high whenever P is zero or whenever $Q=R=1$.

5 L3 2

b) State and prove the DeMorgan's laws using truth table method.

5 L2 1

c) Find the minimal sum expression for the given Boolean function using QM technique. $W=f(a,b,c,d) = \sum m(0,1,2,3,6,7,8,9,14,15)$

6 L3 2

3. a) Obtain minimal sum expression for the given Boolean functions using K-map method.

i) $P=f(a,b,c,d) = \sum m(0,1,2,3,8,9)$

ii) $Q=f(a,b,c,d) = \sum m(0,1,2,3,6,7,8,9,14,15)$

iii) $R=f(a,b,c,d) = \prod M(1,2,3,4,9,10) + dc(0,14,15)$

5 L3 2



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EC1002-2 – APPLIED DIGITAL LOGIC DESIGN

(For AD, AM, CB, CC, CS, IS, RI)

Duration: 1 Hour

Note: Answer any One full question from each Unit.

Unit – I

Marks

BT

1. a) Simplify the following switching equations using Boolean theorem and realize the minimal expression using basic gates.

i) $F = \bar{X}\bar{Y}\bar{Z} + X\bar{Y}Z + \bar{X}Y\bar{Z} + XYZ$

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

5

L*

- b) Using K-Map, find Minimal Sum expression for the following switching functions.

i) $f(a, b, c) = \sum m(1, 2, 3, 6, 7)$

ii) $f(a, b, c) = \sum m(2, 4, 5, 6, 7)$

5

L3

2. a) Perform conversion on the following numbers, clearly showing the steps.

i) $(25.625)_{10} = (?)_2$

ii) $(42A.12)_{16} = (?)_{10}$

iii) $(1011001.0110111)_2 = (?)_{10}$

5

L3

- b) Design a combinational logic truth table so that an output is generated indicating when the majority of four inputs are true. Also derive the Boolean expression from the truth table.

5

L3

Unit – II

3. a) Convert the following functions into proper canonical form.

i) $f(w, x, y, z) = \bar{w}x + y\bar{z}$

ii) $f(a, b, c, d) = (a + \bar{b} + c)(\bar{a} + d)$

5

L3

- b) State and prove De-Morgan's theorem using the tabular method.

5

L3

4. a) Perform the following conversion clearly showing the steps.

$(52.52)_{10} = (?)_2 = (?)_{16}$

5

L3

- b) Using K-Map, find Minimal Sum expression for the following switching function.

$f(a, b, c, d) = \sum m(1, 3, 4, 5, 7, 8, 9, 11, 15)$

5

L3

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome



NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte(Deemed to be University)

II Sem B.Tech. (CBCS) Mid Semester Examinations - I, February 2024

CY1003-1- MATERIALS CHEMISTRY FOR COMPUTER SYSTEMS

(For AD, AM, CB, CC, CS, IS, RI)

Duration: 1 Hour

Max. Marks: 100

Note: Answer any One full question from each Unit.

Unit – I		Marks	BT*	CO*
1. a)	Explain the construction and working of Calomel electrode.	4	L*2	1
b)	Describe the experimental method of determination of pH using glass electrode.	3	L2	1
c)	A concentration cell was constructed by immersing two silver electrodes in 0.036 M and 0.063 M AgNO ₃ solution. Write the cell reaction and calculate the EMF of the cell.	3	L3	1
2. a)	Describe the construction and working of methanol-oxygen fuel cell. List out any two advantages of methanol as a fuel in fuel cells.	5	L2	1
b)	Write any two differences between battery and fuel cells	1	L2	1
c)	Derive an expression for glass electrode potential.	4	L2	1
Unit – II				
3. a)	Describe the construction and working of Li-ion Battery and mention the advantages of lithium metal as an anodic material.	5	L2	1
b)	Discuss the theory of conductometric estimation and explain its application in strong acid vs strong base titration	5	L2	1
4. a)	Explain the construction and working of Na-ion battery. Mention any two applications of it.	5	L2	1
b)	Define degree of polymerization. In a sample of a polymer, 23% molecules have molecular mass 14765 g/mol, 34% molecules have molecular mass 26453 g/mol, and remaining molecules have molecular mass 16879g/mol, calculate the number average and weight average molecular mass of the polymer.	5	L3	

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

Unit – I

		Marks	BT*
1.	a) Explain the construction and working of calomel electrode.	06	L2
	b) Describe the construction and working of Li-ion battery.	06	L2
	c) Explain the determination of pH of an unknown solution using glass electrode.	04	L2
2.	a) Explain the synthesis, properties, and applications of carbon fibre.	07	L2
	b) A polymer has the following composition: 30 molecules of molecular mass 5000g/mol, 40 molecules of molecular mass 6000 g/mol and 50 molecule of molecular mass 8000g/mol. Calculate the number average and weight average molecular mass.	06	L3
	c) Define the following. i) specific conductance, ii) emf, iii) conducting polymer.	03	L1
3.	a) Define concentration cell? The emf of the cell $\text{Cd}/\text{CdSO}_4(0.093\text{M})//\text{CdSO}_4(x\text{ M})/\text{cd}$ is 0.086V at 25°C. Find the value of x.	04	L3
	b) Explain the mechanism in conduction of polyaniline.	06	L2
	c) Explain the construction and working of methanol-oxygen fuel cell.	06	L2

Unit - I

1. a) Define the rms value and obtain the expression for rms value of a sinusoidal alternating current.
- b) An alternating voltage is varying sinusoidally with a frequency of 50 Hz and has an rms value of 230 V. Its instantaneous value at $t=0$ is zero.
 - (i) Write down the equation for the instantaneous value of the voltage.
 - (ii) Find the instantaneous value at 0.125s.
 - (iii) At what time instant is the instantaneous value equal to 230 V?
- c) In Fig. Q1(c), find the voltage across 8Ω resistor using mesh analysis. Also find out the power consumed by the said resistor.

Marks BT* CO*

5 L2 1

5 L2 2

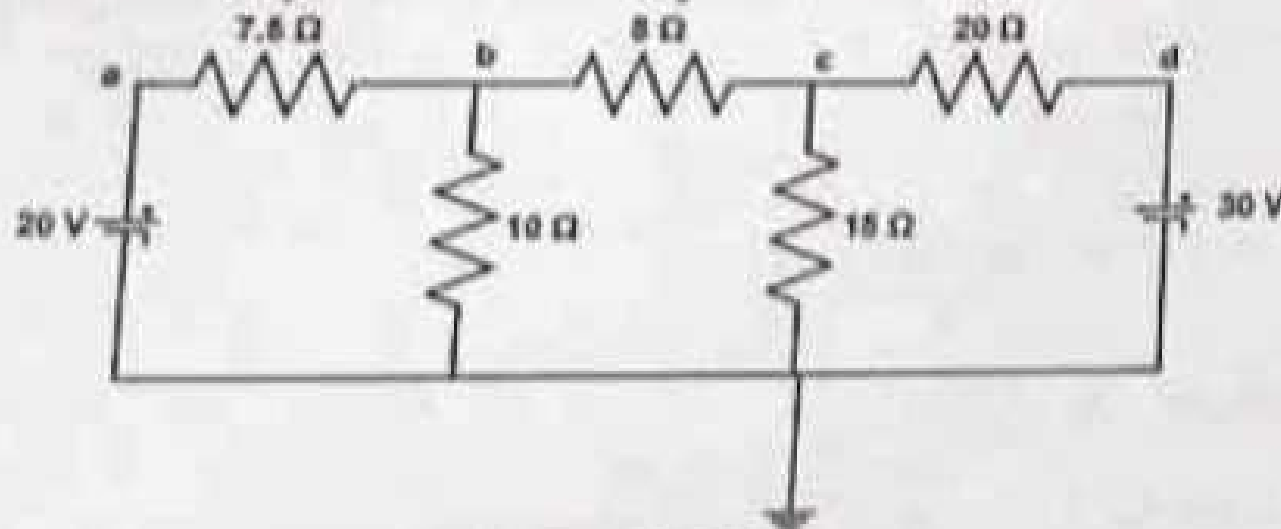


Fig. Q1(c)

6 L2 1

2. a) Analyze a series AC R-L circuit with waveforms and phasor diagram. Hence obtain an expression for the average power consumed by this circuit.
- b) Define: (i) Form factor (ii) Peak factor
(iii) Average Value (iv) Frequency of an alternating quantity.
- c) With appropriate diagrams, prove that the line voltage in a star-connected 3-phase AC system is $\sqrt{3}$ times the phase voltage.

6 L4 2

5 L2 2

5 L3 2

Unit – I

Marks BT* CO

1. a) Write a Python program to calculate the area of a circle. The program should prompt the user to enter the radius of the circle and then calculate and output the area.
b) List and explain the features of the Python programming language.
2. a) Explain the syntax of the if-else statement and for loop with a programming example for both.
b) Write Python Program to reverse a number and also find the Sum of digits in the reversed number. Prompt the user for input.
3. a) What is a variable and what are data types? Illustrate the naming conventions for variables.
b) Develop a program to show the four different uses of the range function with for loop.
c) Explain how random numbers are generated in python. Write a suitable code snippet.

8

L2

1

8

L1

1

8

L2

1

8

L3

1

4

L1

1

8

L2

1

4

L2

1

Unit – I

1. a) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.

b) Consider the premises:

"It's not sunny and it's colder than yesterday".

"We will go swimming only if it's sunny."

"If we don't go swimming then we will take canoe trip."

"If we take a canoe trip, then we will be home by sunset."

Prove that the conclusion: "We will be home by sunset." is valid.

c) Determine the truth value of each of these statements if the domain consists of all real numbers:

i) $\exists x(x^2 = -1)$ ii) $\exists x(x^4 < x^2)$

iii) $\forall x((-x)^2 = x^2)$ iv) $\forall x(2x > x)$

6

L2

6

L3

4

L1

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit - I

		Marks	BT*
1.	a) What are the various categories or classifications of computers?	07	L1
	b) Write a Python Program to display all prime numbers within an interval.	05	L1
	c) What is the method for adding comments in the Python programming language?	04	L1
2.	a) Explain block diagram of computer and its components.	06	L1
	b) Write a Python program to check whether the given integer is a multiple of both 5 and 7.	04	L3
	c) Write a Python program to find the roots of a quadratic equation.	06	L3