

NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)
Second Semester B.Tech (CBCS) Degree Examinations

May 2024

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

Duration: 3 Hours

Max. Marks: 100

Note:

Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

Part – B: Descriptive Answer Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I & Unit – II each** and **One full** question from **Unit – III**.

PART - A: MULTIPLE CHOICE QUESTIONS

20 Marks

1. **What is the purpose of the "if" statement in Python?**
 - A) To iterate over a list
 - B) To define a function
 - C) To perform conditional execution
 - D) To create a dictionary
2. **What is the output of the following code?**

```
x = 5
if x > 3:
    print("Hello")
else:
    print("Hi")
```

 - A) Hello
 - B) Hi
 - C) Neither
 - D) Both
3. **How can you add an element to the end of a list in Python?**
 - A) append()
 - B) insert()
 - C) extend()
 - D) add()
4. **What is the result of the expression 5 % 2?**
 - A) 0
 - B) 2
 - C) 1
 - D) 3
5. **Which loop is used for iterating over a sequence (e.g., a list or string) in Python?**
 - A) while
 - B) for
 - C) do-while
 - D) loop
6. **What is the purpose of the "elif" keyword in Python?**
 - A) To end the program
 - B) To create a new list
 - C) To define a function
 - D) To add an alternative condition to "if"
7. **Which data structure in Python is mutable?**
 - A) Tuple
 - B) List
 - C) String
 - D) Set
8. **How do you declare a dictionary in Python?**
 - A) {}
 - B) []
 - C) ()
 - D) < >
9. **Which operator is used for exponentiation in Python?**
 - A) **
 - B) ^
 - C) //
 - D) *
10. **What does the "return" statement do in a Python function?**
 - A) Prints a value to the console
 - B) Exits the function immediately
 - C) Returns a value to the caller
 - D) Raises an exception
11. **How do you remove an item from a list by its value in Python?**
 - A) remove()
 - B) delete()
 - C) pop()
 - D) discard()

12. What is the output of the code snippet below?
`numbers = [1, 2, 3, 4, 5]`
`squared = [x**2 for x in numbers]`
`print(squared)`
 A) [1, 4, 9, 16, 25] B) [1, 2, 3, 4, 5]
 C) [1, 8, 27, 64, 125] D) [2, 4, 6, 8, 10]
13. How do you access the value associated with a specific key in a dictionary?
 A) Using the index B) Using a loop
 C) Using the key itself D) Using the value() function
14. Which of the following is a valid way to comment out multiple lines of code in Python?
 A) // Comment B) /* Comment */
 C) # Comment D) "" Comment ""
15. What does the "continue" statement do in a loop?
 A) Terminates the loop B) Skips the current iteration and proceeds to the next
 C) Restarts the loop from the beginning D) Does nothing
16. Which of the following is not a valid data type in Python?
 A) int B) float
 C) char D) bool
17. How do you check the length of a list in Python?
 A) size() B) length()
 C) count() D) len()
18. What is the output of the following code snippet?
`def add(x, y):`
 `return x + y`

`result = add(2, 3)`
`print(result)`
 A) "5" B) 5
 C) 23 D) "23"
19. What does the range() function return in Python ?
 A) A list of integers B) A tuple of integers
 C) A range object D) A string
20. From the given syntax, which of the following is the correct syntax to create a dictionary?
 A) Dict=[1:"hi",2:"hello" B) Dict={ 1:"hi",2:"hello"}
 C) Dict={ 1:"hi",2:"hello"} D) Dict=[1:"hi",2:"hello"]

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I		Marks	BT*	CO*	PO*
1.	a) Compare and contrast primary and secondary memory in computer.	6	L*2	1	1
	b) Define the following terms with example.				
	i. Operator				
	ii. Datatypes	4	L2	2	1
	c) Develop a python program to find GCD and LCM of given numbers.	6	L3	2	2
2.	a) Design an algorithm and flowchart to find the factorial of given number.	7	L3	1	2
	b) Illustrate loops in python with an example.	9	L2	1	1
3.	a) Explain steps for program development with a neat diagram.	8	L2	1	1
	b) Explain elif conditional statement in python. Develop a python program to find the roots of a quadratic equation $ax^2 + bx + c = 0$	8	L3	2	2

Unit – II

4.	a)	Define list and explain accessing of list elements with code snippet.	5	L2	3	1
	b)	Design a python program to perform binary search for unsorted elements by designing two separate functions to perform search and sort. Hint: sort() built-in function can be used.	8	L3	4	2
	c)	List and explain any three advantages of functions in python.	3	L2	4	1
5.	a)	Compare and contrast difference between list and tuples.	5	L2	3	1
	b)	Define dictionaries. Illustrate any three built-in function on dictionaries with example.	6	L2	3	1
	c)	Design python program to extract the keys from a given dictionary using function approach.	5	L3	4	2
6.	a)	Write a Python program to read a list of n integers (positive as well as negative). Create 2 new lists, one having all positive numbers and others having all negative numbers from the given list. Print all 3 lists.	10	L3	3	2
	b)	Explain any three list operations in python with example.	6	L2	3	1

Unit – III

7.	a)	Write a Python program that takes a string input from the user and performs the following operations:				
	i)	Count the number of characters in the string and display the result.				
	ii)	Convert all characters in the string to uppercase and display the result.				
	iii)	Check if the string contains the word (case-insensitive) and display the result as True or False.				
	iv)	Split the string into a list of words and display the result.				
	v)	Join the list of words using a hyphen as a separator and display the result.				
	vi)	Reverse the order of the characters in the string and display the result.	10	L3	5	2
	b)	Illustrate the slicing of string with an example.	6	L2	5	1
8.	a)	Define file. Illustrate read and write operation in file with a code snippet.	8	L2	5	1
	b)	Write a function display_words() in python to read lines from a text file "story.txt", and display those words, which are less than 4 characters.	8	L2	5	2

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

EE1001-2 – BASIC ELECTRICAL ENGINEERING
(AD, AM, CB, CC, CS, IS, RI)

Note:

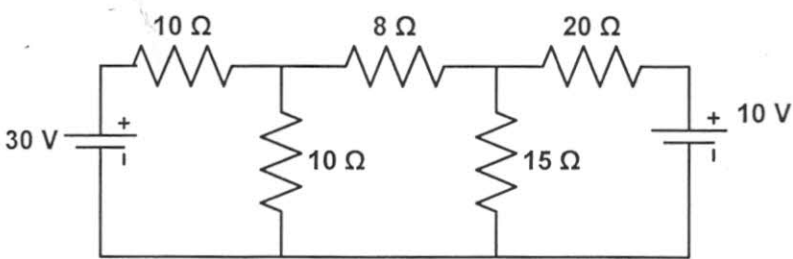
Part – B: Descriptive Answer Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I & Unit – II each** and **One full** question from **Unit – III**.

20 Marks

1. Peak factor of a sinusoidal current is _____
A) 0.707
B) 1.414
C) 1.11
D) None of these
2. If an alternating current has its RMS value 5 A, frequency 60 Hz, its instantaneous value is given by _____
A) $i = 5 \sin 377t$ A
B) $i = 5/\sqrt{2} \sin 377t$ A
C) $i = 5\sqrt{2} \sin 377t$ A
D) None of these
3. The power factor of an AC circuit is given by _____
A) Cosine of the phase angle between Voltage and current
B) Tangent of the phase angle between Voltage and current
C) The ratio of R by XL
D) The ratio of XL by Z
4. If a 100V, 50Hz, single phase AC supplies a current of 2A to a pure capacitive circuit, the capacitance of the circuit is _____
A) 50 F
B) 637mF
C) 63.7 μ F
D) 0.159F
5. The capacitive reactance is measured in _____
A) ohm
B) farad
C) henry
D) None of these
6. When a Pure resistive Circuit, is energized by an AC supply, the angle between voltage and its current is _____
A) 90°
B) In between 0° and 90°
C) 0°
D) None of these
7. Kirchhoff's laws are useful in determining _____
A) Current flowing in a circuit
B) EMFs and Voltage drops in a circuit
C) Power in a circuit
D) All the above
8. In a phasor diagram, the relationship between the voltage and its current when a pure capacitive circuit is energized by an AC supply is _____
A) Voltage lags its current by 90°
B) Voltage leads its current by 90°
C) Voltage lags its current by angle in between 0° and 90°
D) Voltage leads its current by angle in between 0° and 90°
9. The reluctance of a magnetic material _____
A) Decreases with increasing cross-sectional area of material
B) Increases with the increasing cross-sectional area of material
C) Does not vary with the increasing cross-sectional area of material
D) None of these
10. The material used for brushes of DC generator is _____
A) Carbon
B) Copper
C) Both (a) and (b)
D) None of the above

11. In an induction motor, the difference between the synchronous speed of the magnetic field and the actual speed of the rotor is called as the
 - A) Synchronous speed
 - B) slip speed
 - C) Asynchronous speed
 - D) maximum speed
12. The number of parallel paths in 8 pole wave wound DC generator is
 - A) 2
 - B) 16
 - C) 8
 - D) 4
13. The secondary voltage of a 10kVA transformer with load current of 10A is _____
 - A) 10kV
 - B) 100kV
 - C) 1kV
 - D) none of the above
14. In a given transformer for given applied voltage, which of the following losses remain constant irrespective of load changes?
 - A) Friction and windage losses
 - B) Copper losses
 - C) Hysteresis and eddy current losses
 - D) Cannot be determined
15. A transformer is designed so that primary and secondary have _____
 - A) high leakage reactance
 - B) large resistance
 - C) tight magnetic coupling
 - D) good electrical coupling
16. A 2000/200V, 20kVA ideal transformer has 66 turns in the secondary. The number of primary turns is _____
 - A) 440
 - B) 660
 - C) 550
 - D) 330
17. The transmission unit in EV comprises of _____
 - A) Gear Box
 - B) Hinges and Levers
 - C) Rack and Pinion
 - D) Crank Shaft
18. The feature of Electric Motor important for an EV is _____
 - A) High Starting Torque
 - B) High power density
 - C) High efficiency
 - D) All of the above
19. In a boost converter which of the statement is true
 - A) Input voltage is more than output voltage
 - B) Input voltage is less than output voltage
 - C) Input voltage is same as output voltage
 - D) Input and output voltages are independent
20. Earthing is necessary to give protection against _____
 - A) voltage fluctuation
 - B) Overloading
 - C) electric shock
 - D) high temperature of the conductors

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I		Marks	BT*	CO*	PO*
1.	a) Define average value of an alternating quantity. Derive an expression for average value of an alternating current.	5	L*2	1	2
	b) Using mesh analysis, find the current through 15Ω resistor in the circuit shown in Fig: Q1b.				
					
	Fig: Q1b	7	L3	1	2
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.	4	L2	2	2
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.	5	L2	2	2

- | | | | | | |
|-------|--|---|----|---|---|
| b) | A coil of resistances $8\ \Omega$ and inductance 15mH is connected in series with a capacitor of capacitance $150\mu\text{F}$, across a single-phase supply of 230V , 50Hz . Calculate (i) impedance of the circuit (ii) current (iii) power consumed. | 7 | L3 | 2 | 2 |
| c) | Define the terms (i) phase (ii) power factor (iii) form factor (iv) frequency. | 4 | L1 | 1 | 2 |
| 3. a) | Discuss the principle of generation of alternating voltage. | 5 | L1 | 1 | 2 |
| b) | With a neat phasor representation obtain a relation between the line and phase voltages of a delta connected three phase balanced system. Obtain the expression for power. | 6 | L2 | 2 | 2 |
| c) | A balanced star connected load of resistance 8Ω and inductance 6Ω per phase is connected to a balanced 3-phase 400V supply. Find the line current, power factor and the power supplied to the load. | 5 | L3 | 2 | 2 |

Unit – II

- | | | | | | |
|-------|--|---|----|---|---|
| 4. a) | Derive the EMF equation of DC generator. | 5 | L2 | 3 | 2 |
| b) | Explain the principle of operation of a 3 Phase Induction Motor. | 6 | L2 | 3 | 2 |
| c) | In a 75 kVA , single phase transformer the iron and full load copper losses are 700W & 1200W . Find efficiency at 0.8 p.f lagging and load at which maximum efficiency occurs. | 5 | L1 | 4 | 2 |
| 5. a) | State and explain: | | | | |
| | (i) Faraday's Laws of Electromagnetic Induction | 5 | L2 | 4 | 2 |
| | (ii) Lenz Law. | 6 | L1 | 4 | 2 |
| b) | Explain different types of losses in transformer. | | | | |
| c) | A 230 V D.C. shunt motor takes 32 A at full load. Find the back e.m.f. on full load if the resistances of armature and shunt field windings are $0.2\ \Omega$ and $115\ \Omega$ respectively. | 5 | L3 | 3 | 2 |
| 6. a) | Explain the characteristics of DC series motor. | 5 | L2 | 3 | 2 |
| b) | A 125 kVA transformer has a primary voltage of 2000 volts at 50Hz . The number of primary turns are 182 and secondary turns are 40 . Neglecting losses, calculate (i) No load secondary e.m.f (ii) full load primary and secondary current. | 6 | L3 | 4 | 2 |
| c) | Explain the principle of operation single phase Induction motor. | 5 | L2 | 3 | 2 |

Unit – III

- | | | | | | |
|-------|--|---|----|---|---|
| 7. a) | With neat diagram explain step up converter. | 8 | L3 | 5 | 2 |
| b) | With neat block diagram explain the different components used in Electric Vehicle. | 8 | L3 | 5 | 2 |
| 8. a) | Why earthing is essential and with neat block diagram explain pipe earthing. | 8 | L3 | 5 | 2 |
| b) | With neat diagram explain 3-way control of lamps. | 8 | L3 | 5 | 2 |

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



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Second Semester B.Tech (CBCS) Degree Examinations

May 2024

EC1002-2 – APPLIED DIGITAL LOGIC DESIGN
 (ACT, AD, AM, CB, CC, CS, EC, EE, IS, RI, VLSI)

Duration: 3 Hours

Max. Marks: 100

Note:

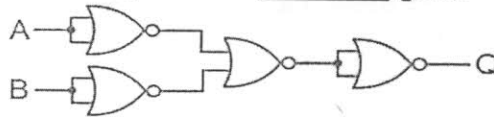
Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

Part – B: Descriptive Answer Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I & Unit – II each** and **One full** question from **Unit – III**.

PART - A: MULTIPLE CHOICE QUESTIONS

20 Marks

- Adding 1010 and 0011 gives the output of
 A) 0111 B) 1011
 C) 1101 D) 1001
- Binary subtraction of 0-1 yields
 A) Difference = 0, borrow = 0 B) Difference = 1, borrow = 0
 C) Difference = 1, borrow = 1 D) Difference = 0, borrow = 1
- If A and B are the inputs of a half adder, the sum is given by ____
 A) A XOR B B) A OR B
 C) A XNOR B D) A AND B
- The Boolean expression $AB+AC'+BC$ simplifies to
 A) $BC+AC'$ B) $AB+AC'+B$
 C) $AB+A'$ D) $AB+BC$
- The output of the given logic circuit represents _____ gate.



- _____ are universal logic gates.
 A) NAND and NOR B) NOR AND EX-OR
 C) EX-OR and EX-NOR D) NOT and AND
- A 4x1 Mux will have ____ select lines
 A) 4 B) 2
 C) 3 D) 1
- Which of the following expressions represent exclusive NOR of x and y?
 A) $(x \text{ xor } y)'$ B) $x \text{ xor } y$
 C) $x \text{ or } y$ D) $x \text{ and } y$
- The truth table for an S-R flip-flop has how many VALID entries?
 A) 3 B) 2
 C) 1 D) 4
- A 3 variable Karnaugh map has _____
 A) 18 cells B) 16 cells
 C) 8 cells D) 3 cells
- One way to make a four-bit adder(A+B) constructed using full adders to perform subtraction(A-B) is by:
 A) Inverting the output B) Inverting the carry-in
 C) Inverting the B inputs D) Without any changes

12. Which is the main objective of multiplexer circuit?
 A) Decoding the binary information B) Generation of all minterms in an output function with OR-gate
 C) Generation of selected path between multiple sources and a single destination D) Encoding of binary information
13. If an OR gate has 4 inputs with one input high and the other three low, then the output is
 A) LOW B) HIGH
 C) HIGH or LOW depending on the input magnitude D) Alternately HIGH and LOW
14. In which one of the following counters, the flip flops are not clocked simultaneously?
 A) Synchronous counter B) Asynchronous counter
 C) Positive edge triggered counter D) Negative edge triggered counter
15. The characteristic equation for T flip flop is
 A) $TQ + T\bar{Q}$ B) $\bar{T}Q + T\bar{Q}$
 C) $\bar{T}Q + TQ$ D) $T\bar{Q} + TQ$
16. If a three-variable switching function is expressed as the product of max terms by $f(A,B,C) = \pi(0,3,5,6)$ then it can also be expressed as sum of min terms by _____.
 A) $\pi(1,2,4,7)$ B) $\Sigma(0,3,5,6)$
 C) $\Sigma(1,2,4,7)$ D) $\Sigma(1,2,3,7)$
17. The characteristic equation for D flip flop is
 A) D B) DQ
 C) \bar{D} D) $D\bar{Q}$
18. A circuit that converts n inputs to 2^n outputs is called
 A) Encoder B) Decoder
 C) Comparator D) Adder
19. A serial in parallel out, 4-bit shift register initially contains all 1s. The data nibble 0111 is waiting to enter. After four clock pulses, the register contains _____.
 A) 0111 B) 0101
 C) 1110 D) 1100
20. Number of flip-flops required to design a counter to count from 0 to 2 is
 A) 4 B) 2
 C) 6 D) 8

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I

- | | Marks | BT* | CO* | PO* |
|--|-------|-----|-----|-----|
| 1. a) Simplify the following using Boolean algebra:
$(A + B' + C')(A + B' + C)(A + B + C')$. | 6 | L*3 | 1 | 1 |
| b) Prove De-Morgan's theorems using the truth table approach. | 6 | L2 | 1 | 1 |
| c) Minimize the given logic function using the K-map method.
$F(A,B,C) = A'BC' + ABC' + ABC$. | 4 | L3 | 1 | 1 |
| 2. 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.
$Y = f(a, b, c) = c'$. | 6 | L3 | 2 | 1 |
| b) Use 2's complement method to find: (i) 1101-1001 (ii) 1001-1101. | 6 | L3 | 2 | 1 |
| c) Perform the conversion for the following and show each step clearly.
(i) $1A2_{16} = (?)_{10}$ (ii) $45.25_{10} = (?)_2$ | 4 | L2 | 1 | 1 |
| 3. 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. | 6 | L3 | 2 | 1 |

- | | | | | |
|--|---|----|---|---|
| b) Simplify the logic function $f(a,b,c) = \sum m(0,2,3,4,6,7)$ using QM technique | 6 | L3 | 2 | 1 |
| c) Use K-map to minimize the logic function $f(a,b,c) = \sum m(0,2,3,4,6,7)$. | 4 | L3 | 2 | 1 |

Unit – II

- | | | | | |
|--|---|----|---|---|
| 4. a) Implement the given function using an active high decoder: | | | | |
| i. $F1(a,b,c) = \sum m(1,2,6)$ | | | | |
| ii. $F2(a,b,c) = \sum m(0)$ | | | | |
| iii. $F3(a,b,c) = \sum m(3,4,5)$ | 6 | L3 | 3 | 1 |
| b) Convert: | | | | |
| i) JK flip flop to D Flip Flop, | 6 | L3 | 4 | 1 |
| ii) JK Flip Flop to T Flip Flop. | 4 | L2 | 3 | 1 |
| c) Explain the working of 4 to 2 Encoder | | | | |
| 5. a) Explain with an example the working of 4-bit binary parallel adder/subtractor with relevant block diagram. | 6 | L2 | 3 | 1 |
| b) Explain the working of edge triggered D flip flop with relevant logic diagram and function table. | 6 | L2 | 4 | 1 |
| c) Explain the working of 2x1 Multiplexer. | 4 | L2 | 3 | 1 |
| 6. a) Implement a Full Adder using a 4x1 multiplexer. | 6 | L3 | 3 | 1 |
| b) Explain the operation of master-slave JK flip-flop with truth table and timing diagram. | 6 | L2 | 4 | 1 |
| c) Obtain the characteristic equation of a JK flip flop. | 4 | L3 | 4 | 1 |

Unit – III

- | | | | | |
|---|---|----|---|---|
| 7. a) Explain the working of a 3-bit ripple-up counter using the positive edge-triggered T flip-flops with a relevant logic diagram and the count sequence. | 8 | L2 | 5 | 1 |
| b) Explain the operations of the 4-bit serial in parallel out type shift register using D flip flops with relevant circuit diagrams and suitable examples. | 8 | L2 | 5 | 1 |
| 8. a) Design a synchronous 3-bit up counter using positive edge triggered D flip flops. | 8 | L3 | 5 | 1 |
| b) Design a synchronous 3-bit down counter using positive edge triggered T flip flops. | 8 | L3 | 5 | 1 |

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)

Second Semester B.Tech (CBCS) Degree Examinations

May 2024

MA1007-1 – DISCRETE MATHEMATICS AND TRANSFORM TECHNIQUES

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

Duration: 3 Hours

Max. Marks: 100

Note:

Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

Part – B: Descriptive Answer Questions: Answer **Five full** questions choosing **One full** question from each **Unit**.

PART - A: MULTIPLE CHOICE QUESTIONS

20 Marks

- According to De Morgan's theorem, $\neg(p \wedge q)$ is logically equivalent to _____.
 A) $\neg p \wedge \neg q$ B) $\neg p \vee \neg q$
 C) $\neg p \Rightarrow \neg q$ D) $\neg p \equiv \neg q$
- In a valid form of disjunctive syllogism, if ' $p \vee q$ ' is the first premise and ' $\neg p$ ' is the second premise, the conclusion will be \therefore _____.
 A) $\neg p$ B) $\neg q$
 C) $p \wedge q$ D) q
- $\neg(A \vee q) \wedge (A \wedge q)$ is a _____.
 A) Always True B) Always False
 C) q D) $\neg q$
- Which one of the following formulae in predicate calculus is valid?
 A) $\neg \forall x P(x) \equiv \forall x \neg P(x)$ B) $\neg \forall x P(x) \equiv \exists x P(x)$
 C) $\neg \exists x P(x) \equiv \exists x \neg P(x)$ D) $\neg \exists x P(x) \equiv \forall x \neg P(x)$
- Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 2)\}$ is a relation on A . Then R is :
 A) Reflexive B) Symmetric
 C) Transitive D) None of these
- An undirected graph contains a Euler's circuit if and only if
 A) All it's vertices are of even degree B) Exactly two of it's vertices are of even degree
 C) All it's vertices are of odd degree D) Exactly two of it's vertices are of odd degree
- A graph contains 16 edges, with 3 vertices of degree 4 and all other vertices of degree 2. The number of vertices of degree 2 are:
 A) 10 B) 4
 C) 2 D) 5
- The chromatic number of C_5 is
 A) 2 B) 3
 C) 4 D) 5
- The method which approximates the curve to the tangent to find root of an algebraic equation is:
 A) Newton-Raphson method B) Taylor's series method
 C) Regula-Falsi method D) Euler's method
- The initial approximation $y_1^{(0)}$ in the modified Euler's method is
 A) $y_0 + hf(x_0, y_0)$ B) $y_0 - hf(x_0, y_0)$
 C) $y_0 + f(x_0, y_0)$ D) $y_0 - f(x_0, y_0)$

11. Given the equation $x^3 + x - 3 = 0$, which of the intervals below contains a root?
 A) $[-1, 1]$ B) $[0, 1]$
 C) $[2, 3]$ D) $[1, 2]$
12. For the heat equation $u_t = \frac{1}{2} u_{xx}$, $h = k = 1$, the value of mesh ratio parameter α is :
 A) A) 1 B) $\frac{1}{2}$
 C) C) 0.25 D) 2
13. The Fourier series expansion of an odd periodic function contains
 A) Only cosine terms B) Cosine terms and a constant
 C) Only sine terms D) Sine terms and a constant
14. The value of a_0 in the half range Fourier cosine series expansion of $f(x) = 2x$ in $(0, 3)$ is
 A) 0 B) 3
 C) 6 D) 9
15. If $F(x(t)) = X(\omega)$, is the Fourier transform of the function $x(t)$, then $F(x(at)) =$
 A) $\frac{1}{a} X\left(\frac{\omega}{a}\right)$ B) $aX(a\omega)$
 C) $\frac{1}{a} X(a\omega)$ D) $aX\left(\frac{\omega}{a}\right)$
16. Which of the following function is odd
 A) $f(x) = \cos x$; $-\pi < x < \pi$ B) $f(x) = x^2$; $-\pi < x < \pi$
 C) $f(x) = k$; $-\pi < x < \pi$ D) $f(x) = x$; $-\pi < x < \pi$
17. If a, b, c are constants and u_n, v_n, w_n are any discrete functions, then $Z(au_n + bv_n - cw_n)$ is:
 A) $aZ(u_n) + bZ(v_n) - cZ(w_n)$ B) $aZ(u_n) + bZ(v_n) - cZ(w_n)$
 C) $aZ(u_n) - bZ(v_n) - cZ(w_n)$ D) $aZ(u_n) + bZ(v_n) + cZ(w_n)$
18. If u_n is a function of n then the unilateral Z-transform of u_n is defined as, $Z(u_n) =$
 A) $\sum_{n=0}^{\infty} u_n z^{-n}$ B) $\sum_{n=0}^{\infty} u_n z^n$
 C) $\sum_{n=-\infty}^{\infty} u_n z^{-n}$ D) $\sum_{n=-\infty}^{\infty} u_n z^n$
19. $Z^{-1}\left(\frac{1}{z-2}\right)$ is :
 A) 2^n B) 2^{n-1}
 C) 2 D) $\frac{1}{2}$
20. If $Z(u_n) = U(z)$ then $Z(a^n u_n)$ is :
 A) $U\left(\frac{a}{z}\right)$ B) $U(za)$
 C) $U\left(\frac{z}{a}\right)$ D) $U(a^n z)$

PART - B: DESCRIPTIVE ANSWER QUESTIONS

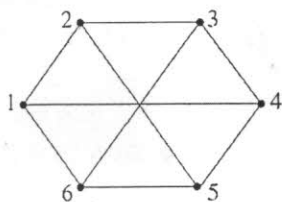
Unit – I		Marks	BT*	CO*	PO*
1. a)	Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.	6	L*2	1	2
b)	Consider the premises: "It's not sunny and it's colder than yesterday". "We will go swimming only if it's sunny." "If we don't go swimming then we will take canoe trip." "If we take a canoe trip, then we will be home by sunset." Prove that the conclusion: "We will be home by sunset." is valid.	6	L3	1	1
c)	Determine the truth value of each of these statements if the domain consists of all real numbers: i) $\exists x(x^3 = -1)$ ii) $\exists x(x^4 < x^2)$ iii) $\forall x((-x)^2 = x^2)$ iv) $\forall x(2x > x)$.	4	L1	1	1

2. a) Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg(p \vee q)$ are logically equivalent by developing a series of logical equivalences. 6 L3 1 1
- b) Use mathematical induction to show that:
 $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all nonnegative integers n . 6 L2 1 2
- c) Using a truth table, show that the compound proposition is a tautology:
 $\neg(p \rightarrow q) \Leftrightarrow p \wedge \neg q$. 4 L1 1 1

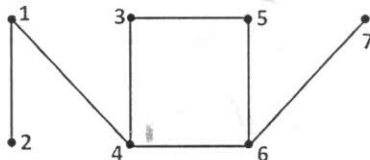
Unit – II

3. a) Let $A = \{1, 2, 3, 4, 6, 8\}$, R be a relation on A defined by aRb if and only if a divides b .
 (i) Find the relation R
 (ii) Draw the digraph of R
 (iii) Find the indegree and outdegree of each vertex
 (iv) Find the matrix M_R . 6 L2 2 1
- b) Define bipartite graphs and complete bipartite graphs. Check whether the following graphs are bipartite or not. If the graph is bipartite, give the bipartitions of each graph.

i)

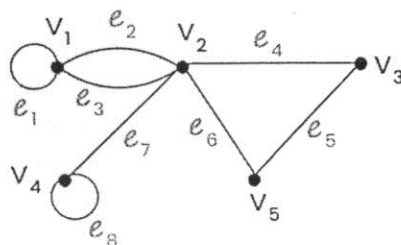


ii)



- c) Let $A = \{1, 2, 3, 4, 5, 6\}$ and $p_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 1 & 2 & 6 & 5 \end{pmatrix}$, $p_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 4 & 3 & 1 & 2 & 5 & 6 \end{pmatrix}$
 and $p_3 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 3 & 1 & 6 & 5 \end{pmatrix}$. Compute (i) $(p_3 \circ p_2) \circ p_1$ (ii) $p_1^{-1} \circ p_2$ 4 L1 2 1

4. a) Let $A = \{1, 2, 3, 4\}$ and $R = \{(1,2), (2,3), (3,1), (4,4)\}$. Find the transitive closure of R using Warshall's algorithm. 6 L1 2 2
- b) What are planar graphs? Are the graphs K_4 and K_5 planar? Justify your answer with suitable diagrams. 6 L2 2 1
- c) Find the adjacency matrix and incidence matrix of the graph:

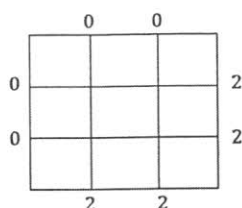


4 L2 2 1

Unit – III

5. a) Using Runge-Kutta method, find $y(0.1)$ given that $\frac{dy}{dx} = 3x + y$, $y(0) = 1$ and $h = 0.1$. 6 L1 3 1

- b) Solve $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values as shown below:



- c) Using the Newton Raphson method, find a real root of $x^2 - \sin x - 2$ taking an initial approximate $x_0 = 2$. Carry out 3 iterations.
6. a) Find the root of the equation $xe^x = \cos x$ using Regula-Falsi method correct to four decimal places in $(0,1)$. Carry out 3 iterations.
- b) Find the solution of the parabolic equation $u_t = \frac{1}{2}u_{xx}$ when $u(0,t) = u(4,t) = 0$ and $u(x,0) = x(4-x)$ taking $h = k = 1$. Find the values of u up to $t = 5$.
- c) Find an approximate value of y when $x = 0.1$, if:
- $$\frac{dy}{dx} = x + y^2, y(0) = 1 \text{ \& } h = 0.1$$
- using Taylor's series method up to third degree terms.

6 L2 3 2

4 L1 3 2

6 L2 3 2

6 L2 3 1

4 L1 3 1

Unit – IV

7. a) If $f(x + 2\pi) = f(x)$, find the Fourier series expansion of $f(x) = x + 1$ in the interval $(-\pi, \pi)$.
- b) Find the Fourier series expansion of $f(x) = |x|$; $f(x + 2\pi) = f(x)$.
- c) Obtain half range Fourier Cosine series for $f(x) = x^2$ in the interval $(0,1)$.
8. a) If $f(t)$ and $g(t)$ are piecewise continuous integrable functions the prove that $F\{(f * g)(t)\} = F\{f(t)\} \cdot F\{g(t)\}$.
- b) Find the Fourier sine transform of $f(t) = \frac{e^{-at}}{t}$, $a > 0$.
- c) Find the Fourier transform of $f(t) = \begin{cases} 1; & |t| \leq 1 \\ 0; & |t| > 1 \end{cases}$.

6 L2 4 1

6 L1 4 2

4 L2 4 1

6 L1 4 2

6 L2 4 1

4 L2 4 2

Unit – V

9. a) Find the Z – transform and ROC of the function $u_n = \begin{cases} 2^{-n}, & \text{if } n \geq 0 \\ 2^n, & \text{if } n < 0 \end{cases}$
- b) State and prove the convolution theorem for bilateral Z – transforms.
- c) Using the method of partial fractions, find the inverse Z – transform of $U(z) = \frac{z}{(z-2)(z-4)}$ in the region $2 < |z| < 4$.
10. a) State and prove the final value theorem for unilateral Z- transforms.
- b) Using Z – transforms, solve the difference equation:
 $u_{n+2} - 2u_{n+1} + u_n = 2^n$ with $u_0 = 2$ and $u_1 = 1$.
- c) State the initial value theorem for unilateral Z- transforms. Using this find the value of u_0 when $U(z) = \frac{z^2}{(2z+1)(z+1)}$.

6 L2 5 1

6 L1 5 2

4 L2 5 1

6 L1 5 2

6 L2 5 1

4 L2 5 2

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

May 2024

CY1003-1 – MATERIALS CHEMISTRY FOR COMPUTER SYSTEMS

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

Max. Marks: 100

Part – A: Multiple Choice Questions: Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

Part – B: Descriptive Answer Questions: Answer **Five full** questions choosing **Two full** questions from **Unit – I & Unit – II each** and **One full** question from **Unit – III**.

20 Marks

1. Potential of the calomel electrode depends on concentration of
A) Hg
B) Hg_2Cl_2
C) KCl
D) KOH
2. Which of the following is an example for ion selective electrode
A) Platinum electrode
B) Gas electrode
C) Calomel electrode
D) Glass electrode
3. Which of the following is suitable for powering portable devices such as smartphones and laptops?
A) Lead-acid battery
B) Lithium-ion battery
C) Methanol-oxygen fuel cell
D) Leclanché cell
4. What is the main component of the electrolyte in a sodium-ion battery
A) NaPF_6
B) NaCl
C) NaSO_4
D) Na_2CO_3
5. The total number of functional groups or bonding sites present in a monomer molecule is called.....
A) Functionality
B) Degree of polymerization
C) Molecular weight
D) Polymer
6. If degree of polymerization of polyethylene is 100, then the molecular weight is.....
A) 2000
B) 2500
C) 2800
D) 1500
7. Polymer composites are made of two components, namely.....
A) Fibre and matrix
B) Matrix and silicone
C) Fibre and butyl rubber
D) butyl rubber and silicone
8. sensor used for colorimetric estimation of copper.
A) Thermometric
B) Gas
C) Optical
D) Electro chemical
9. Anode used in the Electrochemical DO sensor.....
A) Au
B) Ag
C) Pt
D) Zn
10. In an electrochemical sensor electrode acts like a/an.....
A) Modifier
B) Amplifier
C) Transducer
D) Detector
11.type of coating is used in the preparation of printed circuit boards.
A) Electroplating
B) Electroless plating
C) Inorganic coating
D) Organic coating
12. Which among the following is a Flash memory device?
A) Hard Disc Drive (HDD)
B) CD Drive
C) RAM
D) USB drive

13. A ROM is
 A) Read Out Memory
 B) Read Once Memory
 C) Read Only Memory
 D) Read One Memory
14. Liquid crystal molecules have structure
 A) Rod like
 B) Square
 C) Cylindrical
 D) Triangular
15. Which of the following televisions deliver the best picture quality?
 A) LCD
 B) Plasma
 C) 3D
 D) OLED
16. Which of the following component make e-waste hazardous in nature?
 A) Lead
 B) Glass
 C) Plastic
 D) Iron
17. What does e- waste stand for?
 A) Environment waste
 B) Electronic waste
 C) Equipment waste
 D) None of the above
18. What is a good way to dispose of e-waste?
 A) Burn it in your backyard
 B) Give it to a reliable e-waste recycling company
 C) Throw it in the street
 D) Break it into small pieces and dispose
19. A Solar cell is an electrical device that converts the energy of light directly into electricity by effect:
 A) Physical
 B) Chemical
 C) Photovoltaic
 D) Photosynthesis
20. Materials used for solar cell is.....
 A) Silicon
 B) Copper
 C) Iron
 D) Sodium

PART - B: DESCRIPTIVE ANSWER QUESTIONS

Unit – I		Marks	BT*	CO*	PO*
1.	a) Explain the construction and working of calomel electrode.	06	L*2	1	1
	b) Describe the construction and working of Li-ion battery.	06	L2	1	1
	c) Explain the determination of pH of an unknown solution using glass electrode.	04	L2	1	1
2.	a) Explain the synthesis, properties, and applications of carbon fibre.	07	L2	1	1
	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	1	2
	c) Define the following: i) specific conductance, ii) emf, iii) conducting polymer.	03	L1	1	1
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	1	2
	b) Explain the mechanism in conduction of polyaniline.	06	L2	1	1
	c) Explain the construction and working of methanol-oxygen fuel cell.	06	L2	1	1
Unit – II					
4.	a) Explain the working principle of conductometric and optical sensors.	06	L2	2	1
	b) Explain the application of electrochemical sensor for sensing SO _x gas.	04	L2	2	1
	c) Describe the electroless plating of copper on PCB.	06	L2	2	1
5.	a) What are photoactive and electroactive materials. Explain their working principle in display system.	06	L2	2	
	b) Describe the electro-optic effect of liquid crystals.	06	L2	2	1
	c) Give any two properties and application of OLED.	04	L1	2	1

- | | | | | | |
|-------|--|----|----|---|---|
| 6. a) | Describe the principle and working of electrochemical sensor and mention its applications. | 06 | L2 | 2 | 1 |
| b) | Mention any three properties and applications of QLED. | 06 | L1 | 2 | 1 |
| c) | Mention the classification of electronic memory devices | 04 | L1 | 2 | 1 |

Unit – III

- | | | | | | |
|-------|--|----|----|---|---|
| 7. a) | Mention the sources of e-waste and describe the need for e-waste management. | 06 | L2 | 3 | 1 |
| b) | Describe the extraction of gold from e-waste. | 06 | L2 | 3 | 1 |
| c) | What is green fuel? Mention any three advantages of green fuel. | 04 | L1 | 3 | 1 |
| 8. a) | Describe the construction and working of solar photovoltaic cell. | 06 | L2 | 3 | 1 |
| b) | Give any four advantages of recycling. | 04 | L1 | 3 | 1 |
| c) | Discuss the extraction of e-waste by pyro metallurgical process. | 06 | L2 | 3 | 1 |

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