

NMAM INSTITUTE OF TECHNOLOGY, NITTE
Off-Campus Centre of Nitte (Deemed to be University)
Second Semester B.Tech (CBCS) Degree Examinations
May 2025

CS1005-2 – INTRODUCTION TO PYTHON PROGRAMMING
(For BT, ME, 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 **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 does the 'continue' keyword do in a loop?
A) Pauses the loop
B) Stops the loop
C) Skips the rest of the code inside the loop for the current iteration ✓
D) Exits the program
2. What will this code output?
x = 0
if x:
 print("True")
else:
 print("False")
A) True
B) False ✓
C) Error
D) No Output
3. What will be the output of the following Python code?
count = 0
while count < 3:
 print("Hello")
 count += 1
else:
 print("Else block")
A) Prints "Hello" three times and then prints "Else block." ✓
B) Prints "Hello" four times.
C) Prints "Else block" three times.
D) Raises a Syntax Error
4. What will be the output of the following code?
for i in range(1, 6):
 if i == 3:
 continue
 print(i)
A) 1 2
B) 1 2 3
C) 1 2 4 5 ✓
D) 1 2 4
5. Which keyword is used for function?
A) Fun
B) Define
C) def ✓
D) Function
6. What is the purpose of the return statement in a function?
A) To stop the execution of the function
B) To print a value to the console
C) To return a value to the caller ✓
D) To define a recursive function

7. _____ are the arguments passed to a function in correct positional order.
- A) Required arguments ✓ B) Keyword arguments
C) Default arguments D) Variable-length arguments
8. What will be the output of the following code snippet?
- ```
def add(a, b=10):
 return a + b
result = add(5)
print(result)
```
- A) 5 B) 10  
C) 15 ✓ D) Error
9. What will be the output of the following Python code?
- ```
str1="helloworld"
print(str1[ : -1])
```
- A) dlrowolleh ✓ B) hello
C) world D) helloworld
10. Which of the following methods is used to add an element to the end of a list in Python?
- A) append() ✓ B) add()
C) insert() D) extend()
11. What is the output of my_tuple = (1, 2, 3) * 2?
- A) (1, 2, 3, 1, 2, 3) B) (2,4,6)
C) [1,2,3,1,2,3] D) Error ✓
12. What will be the output of len({'apple': 1, 'banana': 2, 'cherry': 3})?
- A) 1 B) 2
C) 3 ✓ D) Error
13. Which of the following file extensions represents a text file?
- A) .csv B) .png
C) .txt ✓ D) .mp4
14. What is the primary use of the append ('a') mode in file handling?
- A) To delete the file content B) To write new content to the file and erase old content
C) To add new content to the end of the file ✓ D) To read the file content
15. What is the default mode in which a file is opened using the open() function in Python?
- A) Write mode ('w') B) Read mode ('r') ✓
C) Append mode ('a') D) Binary mode ('rb')
16. What is the purpose of the csv.reader() method in Python?
- A) To write data to a CSV file B) To read data from a CSV file ✓
C) To delete data from a CSV file D) To rename a CSV file
17. Which block is executed if no exception occurs within the try block?
- A) except B) finally
C) else D) raise
18. What will the output of the following code be?
- ```
try:
 x = 1/0
except ZeroDivisionError:
 x = 0
print(x)
```
- A) 1 B) 0 ✓  
C) An exception will be raised D) 0.5
19. Which Python library is used for data visualization?
- A) NumPy B) Pandas  
C) Matplotlib ✓ D) SciPy
20. What type of plot is created using plt.plot(x, y)?
- A) Bar chart B) Line plot ✓  
C) Scatter plot D) Histogram

**PART - B: DESCRIPTIVE ANSWER QUESTIONS****Unit – I**

|                                                                                                        | Marks | BT* | CO* | PO* |
|--------------------------------------------------------------------------------------------------------|-------|-----|-----|-----|
| 1. a) Explain while loop with syntax and programming example.                                          | 4     | L*2 | 1   | 1   |
| b) What is module? Explain the various methods of importing modules in Python programs.                | 8     | L2  | 2   | 1   |
| c) Write a python program to find the sum of digits and number of occurrences of digit in a number.    | 4     | L3  | 1   | 2   |
| 2. a) What is a variable? What are the rules for writing an identifier?                                | 4     | L1  | 1   | 1   |
| b) List the different types of operators. Explain the following operators with an example program.     |       |     |     |     |
| i. Logical Operators                                                                                   | 8     | L2  | 1   | 1   |
| ii. Identity Operators                                                                                 |       |     |     |     |
| c) Define recursive functions. Develop a python program to find factorial of a number using recursion. | 4     | L3  | 2   | 2   |
| 3. a) Explain nested if conditional statement in python with syntax and programming example.           | 4     | L2  | 1   | 1   |
| b) Explain different type of arguments used in python functions with example program.                  | 8     | L2  | 2   | 1   |
| c) Explain membership operators with a programming example.                                            | 4     | L2  | 1   | 1   |

**Unit – II**

|                                                                                                                                                                                                                                                        |   |    |   |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|---|---|
| 4. a) Define file. Illustrate read and write operation in file with a code snippet.                                                                                                                                                                    | 4 | L2 | 4 | 1 |
| b) Explain the following methods in list with an example:<br>i) len() ii) insert() iii) pop() iv) sort()                                                                                                                                               | 8 | L2 | 3 | 1 |
| c) Write a Python program that takes a sentence as input from the user, calculates and prints the total number of characters in the sentence, and creates a dictionary containing the frequency of letters and digits in the sentence.                 | 4 | L3 | 3 | 2 |
| 5. 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.                           | 4 | L3 | 3 | 2 |
| b) Explain the following methods in a dictionary with example:<br>i) keys() ii) values() iii) items() iv) copy()                                                                                                                                       | 8 | L2 | 3 | 1 |
| c) Write a program to create a CSV file students.csv and store the rows: ["Name", "Age", "Grade"], ["Alice", 23, "A"], ["Bob", 21, "B"] using Python's csv module.                                                                                     | 4 | L3 | 4 | 2 |
| 6. a) How is a tuple different from a list and what function is used to convert list to tuple? Explain.                                                                                                                                                | 4 | L2 | 3 | 1 |
| b) Write a python program to perform binary search on a list of integers.                                                                                                                                                                              | 8 | L3 | 4 | 2 |
| c) Write the output of the following Python code: spam= 'Hello, World!'<br>i) spam[1:6:2] ii) spam[4:-12:-1] iii) spam[5:0:-2] iv) spam[: :-1]                                                                                                         | 4 | L3 | 3 | 1 |
| 7. a) Explain finally keyword with programming example.                                                                                                                                                                                                | 4 | L2 | 5 | 1 |
| b) What is Matplotlib? Write a Python program to create a bar graph using matplotlib to represent the sales of different products in a store by displaying appropriate labels for the axes and title for the chart. Use different colors for each bar. |   |    |   |   |

| Product    | Sales (in units) |
|------------|------------------|
| Laptop     | 160              |
| Phone      | 350              |
| Tablet     | 200              |
| Headphones | 250              |
| Smartwatch | 140              |

8 L3 5 2

## Unit – III

- c) Write a Python program that performs division of two numbers. The program should handle ZeroDivisionError and ValueError (if the input is not a number) and print custom error messages. 4 L3 5 2
8. a) What is Pandas in Python? Write a Python program to create a Pandas DataFrame from the following dictionary and access the third row of the DataFrame.  
data={ 'Name': ['Alice', 'Bob', 'Charlie', 'David'], 'Age': [25, 30, 35, 40], 'Salary': [50000, 60000, 70000, 80000] } 4 L3 5 2
- b) What are Exceptions? Explain the use of try, except, else blocks in Python. Provide examples to show how each block works. 8 L2 5 1
- c) Compare Syntax Error and Exception. Write a Python program that executes an operation on a list and handles an IndexError exception if the index is out of range. 4 L3 5 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)**  
**Second Semester B.Tech (CBCS) Degree Examinations**  
May 2025

**EC1002-2 – APPLIED DIGITAL LOGIC DESIGN**  
(For AC, EC, EE, VL, AD, AM, CB, CC, CS, IS, RI)

Duration: 3 Hours

Max. Marks: 100

**Note:**

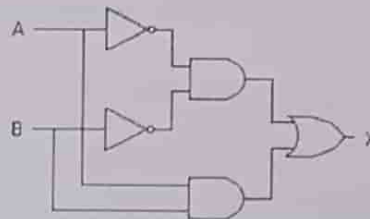
**Part – A: Multiple Choice Questions:** Answer all **Twenty** questions in the **OMR Sheet** provided. Each question carries equal marks.

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

**PART - A: MULTIPLE CHOICE QUESTIONS**

**20 Marks**

1. OR gate and----- will form the NOR gate?  
A) OR gate  
C) NOT gate ✓  
B) NAND gate  
D) AND gate
2. Decimal equivalent of binary number 10101 is  
A) 21 ✓  
C) 22  
B) 12  
D) 31
3. A three variable karnaugh map has \_\_\_\_\_  
A) Eight cells ✓  
C) Sixteen Cells  
B) Three cells  
D) Four cells
4. Which of the following is a SOP expression?  
A)  $(A+B)(A+C)$   
C) Both a and b  
B)  $AB+AC$  ✓  
D)  $(A+B)(C+D)$
5. Which of the following logic expressions represents the logic diagram shown?



- A)  $X=AB'+A'B$   
C)  $X=(AB)'+A'B'$   
B)  $X=(AB)'+AB$   
D)  $X=A'B'+AB$  ✓
6. The decimal equivalent of the binary number  $1011.011_2$  is  
A)  $11.375_{10}$  ✓  
C)  $11.175_{10}$   
B)  $10.123_{10}$   
D)  $9.23_{10}$
7. Which of the following is not considered for forming groups in K-map?  
A) Rolling  
C) Vertical  
B) Diagonal ✓  
D) Horizontal
8. The output of an exclusive-NOR gate is 1. Which input combination is correct?  
A)  $A = 1, B = 0$   
C)  $A = 0, B = 0$  ✓  
B)  $A = 0, B = 1$   
D) none of these
9. How is JK flip-flop made to toggle  
A)  $J = 0, K = 0$   
C)  $J = 1, K = 1$   
B)  $J = 1, K = 0$   
D)  $J = 0, K = 1$  ✓
10. The characteristic equation for S-R flip flop is  
A)  $\bar{S} + \bar{R}Q$   
C)  $S + RQ$   
B)  $\bar{S} + R\bar{Q}$   
D)  $S + \bar{R}Q$  ✓

EC1002-2

11. Full subtractor is used to perform subtraction of \_\_\_\_\_  
 A) 2 bits B) 8 bits  
 C) 4 bits D) 3 bits ✓
12. The full form of SR is  
 A) System rated B) Set reset ✓  
 C) Set ready D) None of these
13. A basic S-R flip-flop can be constructed by cross-coupling of which logic gates?  
 A) AND or OR gates B) XOR or XNOR gates  
 C) NOR or NAND gates ✓ D) AND or NOR gates
14. Latch is a device with \_\_\_\_\_ stable states  
 A) One B) Three  
 C) Infinite D) Two ✓
15. The two input MUX would have \_\_\_\_\_  
 A) 1 select line ✓ B) 2 select lines  
 C) 4 select lines D) 3 select lines
16. Which of the following represents a number of output lines for a decoder with 4 input lines?  
 A) 15 B) 16 ✓  
 C) 17 D) 18
17. The group of bits 11001 is serially shifted (right-most bit first) into a 5-bit parallel output shift register with an initial state 01110. After three clock pulses, the register contains \_\_\_\_\_.  
 A) 01110 B) 00001 ✓  
 C) 00101 D) 10101
18. A modulus-10 counter must have \_\_\_\_\_  
 A) 4 flip-flops ✓ B) 5 flip-flops  
 C) 10 flip-flops D) 3 flip-flops
19. In which one of the following counters, the flip flops are not clocked simultaneously?  
 A) Synchronous counter B) Asynchronous counter/ripple counter ✓  
 C) Both A and B D) None of these
20. A shift register is a digital circuit that \_\_\_\_\_  
 A) Stores data B) Shifts the data from left to right  
 C) Shifts the data from right to left D) All the above ✓

### PART - B: DESCRIPTIVE ANSWER QUESTIONS

#### Unit - I

Marks BT\* CO\* PO\*

1. a) Convert the following functions into canonical form.  
 i)  $f(w, x, y, z) = \bar{w}x + y\bar{z}$  (SOP)  
 ii)  $f(a, b, c, d) = (a + \bar{b} + c)(\bar{a} + d)$  (POS)  
 6 L\*3 1 1  
 b) Using K-map and simplify the following function  
 i)  $f(a, b, c) = \sum m(0, 1, 2, 3, 7)$   
 ii)  $f(a, b, c, d) = \sum m(0, 1, 3, 4, 5, 6, 9, 11, 12, 13, 14)$   
 6 L3 2 1  
 c) Define  
 i) Minterm  
 ii) Maxterm  
 iii) Canonical SOP  
 iv) Canonical POS  
 4 L2 1 1
2. a) Design the combinational logic circuit which takes two, 2 bit numbers as its inputs and generates an output to indicate when the sum of the two numbers is odd.  
 6 L3 2 1  
 b) i)  $12.6532_{(10)} = (?)_{16}$   
 ii)  $CF.52_{(16)} = (?)_{10}$   
 iii)  $1376.185_{(10)} = (?)_2$   
 6 L2 1 1  
 c) Perform the binary subtraction using 2's complement method.  
 i)  $11010010_2 - 01011110_2$   
 ii)  $00110_2 - 11010_2$   
 4 L3 2 1

3. a) Design a combinational logic circuit to generate an output whenever a majority of four inputs is logic 1 and output function is not specified whenever the number of 0's and 1's is equal in the inputs. However, the output is logic zero for the remaining conditions.

8 L3 2 1

- b) Using the QM method simplify the following function

$$f(a, b, c, d) = \sum m(2, 6, 8, 9, 10, 11, 14, 15)$$

8 L3 2 1

## Unit – II

4. a) Implement  $f(a, b, c) = \sum m(1, 4, 5, 7)$  using

i) 8:1 MUX

ii) 4:1 MUX

6 L3 3 1

- b) With logic diagram and function table explain the operation of Set-Reset latch made with NOR gates.

6 L2 4 1

- c) Convert JK flip flop to T flip flop.

4 L3 4 1

5. a) Explain the working of D flip flop with relevant logic diagram and truth table.

6 L2 4 1

- b) Implement the given function using 3 to 8 decoder with minimum number of gate inputs.

i)  $F1(a, b, c) = \sum m(0, 1, 3)$

ii)  $F2(x, y, z) = \sum m(0, 2, 3, 5, 7)$

iii)  $F3(p, q, r) = \pi M(1, 2, 3, 5, 6, 7)$

6 L3 3 1

- c) Explain the working of 8 to 3 line Encoder

4 L2 3 1

6. a) What are the characteristic equations of Flip flop? Obtain the characteristic equation for

i) JK Flip flop

ii) D Flip Flop

6 L3 4 1

- b) Explain the working of a 4-bit binary parallel adder/subtractor using XOR gates with a relevant block diagram and with an example

6 L2 3 1

- c) Design the full adder using 4:1 multiplexer.

4 L2 3 1

## Unit – III

7. a) Design a synchronous counter to sequence  $0 \rightarrow 4 \rightarrow 1 \rightarrow 2 \rightarrow 6 \rightarrow 0$  using positive edge triggered D flip flops with minimal combinational gating.

8 L3 5 1

- b) What is a Ripple counter? Sketch the logic diagram of a 3-bit ripple-up counter using asynchronous positive edge triggered T flip flops. Explain its working with the sequence table and output waveforms.

8 L2 5 1

8. a) Design a synchronous counter to sequence  $0 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 5 \rightarrow 1 \rightarrow 0$  using positive edge triggered T flip flops with minimal combinational gating.

8 L3 5 1

- b) What is a shift register? With the help of a suitable example explain the following operations:

i) SIPO

ii) PISO

8 L2 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 2025**

**EE1001-2 – BASIC ELECTRICAL ENGINEERING**  
(For 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 **Two** full questions from **Unit – I & Unit – II** each and **One** full question from **Unit – III**.

**PART - A: MULTIPLE CHOICE QUESTIONS**

**20 Marks**

1. Capacitor does not allow the sudden change of  
A) Current  
C) Voltage ✓  
B) Power  
D) Frequency
2. Which quantity consists of a unit 1 KWh  
A) Energy ✓  
C) Power  
B) Time  
D) Charge
3. KCL works on the principle of which of the following  
A) Law of conservation of energy  
C) Conservation of momentum  
B) Law of conservation of charge ✓  
D) Conservation of potential energy
4. How many cycles will an AC signal make in 2 seconds if its frequency is 100 Hz?  
A) 50  
C) 100  
B) 200 ✓  
D) 150
5. In series RLC circuit, voltage across resistor, inductor and capacitor are 5V, 2V and 2V respectively. Find total voltage  
A) 9V  
C) 4V  
B) 2V  
D) 5V ✓
6. Which of the following can vary with AC, but never with DC?  
A) Power  
C) Frequency ✓  
B) Voltage  
D) Amplitude
7. In ac circuit the ratio of kW/KVA is  
A) Power factor ✓  
C) Form factor  
B) Load factor  
D) Peak factor
8. What is the angle between the line voltage and the phase voltage in a star connection?  
A) 60 degrees  
C) 0 degrees  
B) 90 degrees  
D) 30 degrees
9. The back emf in a DC motor is \_\_\_\_\_  
A) ✓ Inversely proportional to the speed of the motor  
C) Independent of the speed of the motor  
B) Directly proportional to the speed of the motor ✓  
D) Equal to the supply voltage
10. A DC series motor has  
A) Low starting torque  
C) High starting torque ✓  
B) Constant speed  
D) Low speed regulation
11. In a transformer, the primary and secondary windings are  
A) Electrically connected ✓  
C) Both electrically connected and magnetically coupled  
B) Magnetically coupled  
D) Neither electrically connected nor magnetically coupled



12. The EMF equation of a transformer is  
 A)  $\frac{E_1}{E_2} = \frac{N_1}{N_2}$  ✓  
 B)  $\frac{E_1}{E_2} = \frac{N_2}{N_1}$   
 C)  $E_1 E_2 = N_1 N_2$   
 D)  $E_1 + E_2 = N_1 + N_2$
13. A single phase autotransformer has  
 A) One winding ✓  
 B) Two windings  
 C) Three windings  
 D) Four windings
14. Slip in an induction motor is  
 A) The ratio of synchronous speed to rotor speed  
 B) The ratio of slip speed to synchronous speed  
 C) The difference between synchronous speed and rotor speed ✓  
 D) The sum of synchronous speed and rotor speed
15. The rotor of a three-phase induction motor  
 A) Rotates at synchronous speed  
 B) Rotates at a speed slightly less than synchronous speed ✓  
 C) Rotates at a speed slightly more than synchronous speed  
 D) Does not rotate
16. A rotating magnetic field is produced in a three-phase induction motor by  
 A) Single-phase AC supply  
 B) Three-phase AC supply ✓  
 C) DC supply  
 D) All of these supply
17. What does MCB stand for?  
 A) Miniature Circuit Breaker ✓  
 B) Main Control Board  
 C) Motor Control Box  
 D) Maximum Current Breaker
18. What is the advantage of PMSM over induction motors?  
 A) Simpler design  
 B) Larger size  
 C) Lower cost  
 D) Higher efficiency ✓
19. Buck converter is also called as \_\_\_\_\_  
 A) Step up converter  
 B) Step Up - Step down converter  
 C) Step down converter ✓  
 D) Step down - step up converter
20. What is necessary to provide a path to the leakage current to ground and protect personnel from the danger of shock?  
 A) Fuse  
 B) Earthing ✓  
 C) Circuit Breaker  
 D) Insulator

### PART - B: DESCRIPTIVE ANSWER QUESTIONS

#### Unit - I

1. a) Define average value of alternating quantity. Also mention the average value for sinusoidal ac quantity for one cycle.  
 b) Using mesh analysis, find the voltage drop across the  $3\Omega$  resistor in Fig. 1b

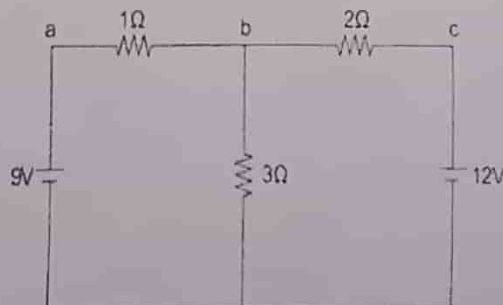


fig. 1b

- c) Deduce the expression for active power in series RL circuit. Also represent instantaneous power using wave forms.

| Marks | BT* | CO* | PO* |
|-------|-----|-----|-----|
| 04    | L*1 | 1   | 1,2 |

|    |    |   |     |
|----|----|---|-----|
| 06 | L3 | 1 | 1,2 |
| 06 | L2 | 2 | 1,2 |

2. a) Define power factor and define various forms of power in single phase circuit.  
 b) Use nodal analysis to find the voltage across and current through  $2\Omega$  resistor in Figure. 2b

04 L3 1 1,2

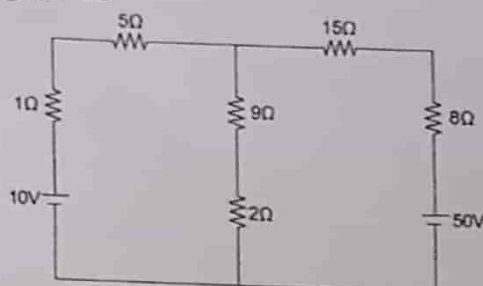


Figure 2b

06 L3 1 1,2

- c) Deduce the relation between line and phase parameters of three phase star connection.

06 L2 2 1,2

3. a) List the advantages of three phase connection over single phase connection.

04 L1 2 1,2

- b) A pure resistance of  $50\Omega$  is in series with a capacitance of  $50\mu\text{F}$ . The series combination is connected across a 230V, 50Hz supply. Find impedance, current and power factor of the circuit.

06 L3 2 1,2

- c) Define root mean square value of an alternating quantity. Derive an expression for RMS value of an alternating current.

06 L2 1 1,2

## Unit – II

4. a) State Faradays laws of electromagnetic induction.

04 L1 3 1,2

- b) Discuss the working principle of three phase induction motor.

06 L2 4 1,2

- c) The primary and secondary windings of a 100 kVA transformer have resistances of  $0.20\Omega$  and  $0.001\Omega$  respectively. The primary and secondary voltages are 2000V and 200 V respectively and the core loss is 1kW. Calculate the efficiency of the transformer at full load and unity power factor.

06 L3 3 1,2

5. a) A four pole DC Motor is connected to a 200V DC supply and takes an armature current of 50A. The resistance of the armature is  $0.2\Omega$ . The armature is lap wound with 200 conductors and useful flux per pole is 0.02 Wb. Calculate the back emf and speed of the motor.

04 L3 3 1,2

- b) Derive the EMF equation of a single phase transformer.

06 L1 4 1,2

- c) In an induction motor, prove that stator magnetic field has constant magnitude and it rotates at synchronous speed.

06 L2 3 1,2

6. a) With neat diagram explain constructional features of three phase induction motor.

04 L1 3 1,2

- b) What is an Autotransformer? List its advantages and applications.

06 L2 4 1,2

- c) A 6 pole 3 phase induction motor operates from a supply whose frequency is 50Hz. Calculate: i) The speed at which the magnetic field of the stator is rotating. ii) The speed of the rotor when the slip is 0.02 iii) Frequency of the rotor currents when the slip is 0.04.

06 L3 3 1,2

## Unit – III

7. a) List necessity of earthing electrical system.

04 L2 5 1,2

- b) Explain the working principle of BLDC motor.

06 L1 5 1,2

- c) With a neat diagram, elaborate the major part of an electric vehicle.

06 L2 5 1,2

8. a) List the necessity of UPS.

04 L2 5 1,2

- b) Discuss the principle of operation of boost converter.

06 L2 5 1,2

- c) What is earthing? With a neat diagram, explain plate earthing.

06 L2 5 1,2

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)**  
**Second Semester B.Tech (CBCS) Degree Examinations**  
May 2025

**CY1003-1 – MATERIALS CHEMISTRY FOR COMPUTER SYSTEMS**  
(For 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 **Two full** questions from **Unit – I & Unit – II each** and **One full** question from **Unit – III**.

**PART - A: MULTIPLE CHOICE QUESTIONS**

**20 Marks**

1. The device which converts electrical energy into chemical energy .....  
A) Galvanic Cell B) Fuel cell  
C) Electrolytic Cell ✓ D) Solar cell
2. What is the electrode potential of the calomel electrode with saturated KCl solution at 298K?  
A) 0.334 V B) 0.281 V  
C) 0.242 V ✓ D) 0.0591 V
3. Which of the following is NOT a component of battery?  
A) Cathode B) Salt-bridge ✓  
C) Anode D) Electrolyte
4. Special properties of 'Li' metal that make it advantageous as an electrode material include .....  
A) Light weight ✓ B) Low electrical conductivity  
C) High electrode potential D) Low cost
5. 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) Vanadium flow battery
6. 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
7. Which of the following is a monomer?  
A) Ethane ✓ B) Ethyl chloride  
C) Ethene D) Ethyl alcohol
8. In the conductometric titration of ....., the conductance increases gradually till equivalence point and then rises sharply.  
A) Strong acid vs strong base B) Strong acid vs weak base  
C) Weak acid vs strong base ✓ D) Weak acid vs weak base
9. The driving force in electroless plating is .....reaction on a pretreated active surface.  
A) Autocatalytic Oxidation B) Autocatalytic reduction  
C) Autocatalytic displacement D) Autocatalytic redox ✓
10. The reference electrode used in the electrochemical gas sensing of NO<sub>x</sub> is .....  
A) Ag/AgCl ✓ B) Zn/ZnCl<sub>2</sub>  
C) Fe/FeCl<sub>2</sub> D) Cu/CuSO<sub>4</sub>
11. 1 nm = .....  
A) 10<sup>-7</sup> m B) 10<sup>-9</sup> m ✓  
C) 10<sup>9</sup> m D) 10<sup>-3</sup> m



12. Which is the preferred precursor in the sol-gel method?  
 A) Metal chlorides B) Metal nitrates  
 C) Metal hydroxides D) Metal alkoxides
13. ROM is defined as .....  
 A) Read Out Memory B) Read Once Memory  
 C) Read Only Memory D) Read One Memory
14. Which computer memory chip allows simultaneous both read and write operations?  
 A) ROM B) RAM  
 C) PROM D) EEPROM
15. Which property of polymers makes them suitable for applications in memory devices?  
 A) High electrical resistance B) Low thermal stability  
 C) Bistable state D) Brittle nature
16. Liquid crystal displays (LCDs) work based on the principle of:  
 A) Electromagnetic induction B) Electrochemical reactions  
 C) Opto-electronic effect D) Liquid crystal polarization
17. Recycling of e-waste has a direct impact on .....  
 A) Environment B) Economy  
 C) Both environment and economy D) Neither environment nor economy
18. Extraction of metals by treatment with HCl is called as ..... leaching.  
 A) Cyanide B) Thiourea  
 C) Acid D) Thiosulphate
19. In which process are the electronic components harvested from e-waste without breaking them into smaller components?  
 A) Hydrometallurgy B) Direct recycling  
 C) Pyrometallurgy D) Electrolysis
20. Splitting of water into hydrogen and oxygen using energy is called .....  
 A) Fission B) Fusion  
 C) Electrolysis D) Photosynthesis

### PART - B: DESCRIPTIVE ANSWER QUESTIONS

| Unit - I  |                                                                                                                                                                                                    | Marks | BT* | CO* | PO* |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|-----|-----|
| 1.        | a) Define reference electrode. Explain the construction and working of calomel electrode.                                                                                                          | 8     | L*2 | 1   | 1   |
|           | b) Explain the construction and working of lithium-ion battery. Mention its applications.                                                                                                          | 8     | L2  | 1   | 1   |
| 2.        | a) Explain the mechanism of conduction in polyacetylene.                                                                                                                                           | 7     | L2  | 2   | 1   |
|           | b) Calculate the number and weight average molecular weights of a polymer with 200 molecules of molecular mass 500; 300 molecules of molecular mass 2000 and 500 molecules of molecular mass 3500. | 6     | L3  | 2   | 2   |
|           | c) Mention the advantages of instrumental techniques over traditional methods.                                                                                                                     | 3     | L1  | 2   | 1   |
| 3.        | a) How is glass electrode used to determine the pH of unknown solution?                                                                                                                            | 4     | L2  | 1   | 1   |
|           | b) Calculate the cell potential of the following cell at 298K<br>$\text{Ag}   \text{Ag}^+(0.001\text{M})    \text{Ag}^+(0.50\text{M})   \text{Ag}$                                                 | 3     | L3  | 1   | 2   |
|           | c) Describe the basic principle and working of conductometry for the estimation of strong and weak acid.                                                                                           | 9     | L2  | 2   | 1   |
| Unit - II |                                                                                                                                                                                                    |       |     |     |     |
| 4.        | a) Highlight the principle governing electrochemical sensors. How is it used to detect SO <sub>x</sub> ?                                                                                           | 6     | L2  | 3   | 1   |
|           | b) Demonstrate the process of PCB fabrication using electroless plating technique. Mention the advantages of electroless plating.                                                                  | 10    | L3  | 3   | 1   |

**CY1003-1****SEE-May 2025**

- |    |    |                                                                                                          |    |    |   |   |
|----|----|----------------------------------------------------------------------------------------------------------|----|----|---|---|
| 5. | a) | Describe the electronic memory storing capacity of organic molecules by taking the example of pentacene. | 8  | L2 | 4 | 1 |
|    | b) | Explain the opto-electronic effect observed in LCs. Demonstrate their application in LCDs.               | 8  | L3 | 4 | 1 |
| 6. | a) | Discuss the working of amperometric and optical sensors in the determination of DO.                      | 6  | L2 | 3 | 1 |
|    | b) | Classify the electronic memory based on volatility.                                                      | 10 | L1 | 4 | 1 |

**Unit – III**

- |    |    |                                                                                                           |   |    |   |   |
|----|----|-----------------------------------------------------------------------------------------------------------|---|----|---|---|
| 7. | a) | Explain the steps involved in the hydrometallurgical extraction method for metal recovery from e-waste.   | 8 | L2 | 5 | 1 |
|    | b) | Enumerate the properties of hydrogen fuel. Demonstrate the generation of green hydrogen by PEM method.    | 8 | L1 | 5 | 1 |
| 8. | a) | Explain the construction and working of solar photovoltaic (PV) cell. What are the advantages of PV cell? | 9 | L2 | 5 | 1 |
|    | b) | Explain the stages involved in the process of gold recovery from e-waste.                                 | 7 | L2 | 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 2025

**MA1007-1 – DISCRETE MATHEMATICS AND TRANSFORM TECHNIQUES**

(For 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**

1. Let  $p$  be the proposition "It is sunny this afternoon" and  $q$  be the proposition "We will go swimming", Which of the following is the symbolic form the statement "We will go swimming only if it is sunny this afternoon".  
A)  $p \rightarrow q$  B)  $q \rightarrow p$  ✓  
C)  $p \vee q$  D)  $p \wedge q$
2. The conclusion of the hypothesis "If George does not have eight legs, then he is not an insect" and "George is an insect" is  
A) George does not have eight legs B) George is not an insect  
C) George has eight legs ✓ D) Can't conclude anything from the given hypothesis
3. Contrapositive statement of the statement  $\neg p \rightarrow \neg q$  is:  
A)  $\neg p \rightarrow \neg q$  B)  $p \rightarrow q$   
C)  $\neg q \rightarrow p$  D)  $q \rightarrow p$  ✓
4. In proving  $\sqrt{5}$  as irrational, we begin with assumption  $\sqrt{5}$  is rational in which type of proof?  
A) Direct proof B) Proof by Contradiction ✓  
C) Mathematical Induction D) Not Indirect Proof
5. Which of the following statement is not correct?  
A) A reflexive relation has a cycle of length one at every vertex. B) The matrix of reflexive relation must have all 1's in its main diagonal.  
C) If  $R$  is reflexive relation on  $A$ , then  $\text{Domain}(R) = \text{Range}(R) = A$ . D) The matrix of reflexive relation must have all 0's in its main diagonal. ✓
6. If  $p = (2,3,4,7)$  is a permutation of the set  $A = \{1,2,3,4,5,6,7,8\}$  then  $p^{-1}$  is:  
A)  $(4,7,2,3)$  B)  $(7,4,3,2)$  ✓  
C)  $(7,4,2,3)$  D)  $(3,4,7,2)$
7. The complete graph with eight vertices has.....edges.  
A) 64 B) 24  
C) 28 ✓ D) 36
8. A simple graph can have \_\_\_\_  
A) multiple edges B) self loops  
C) parallel edges D) no multiple edges, self loops and parallel edges ✓
9. The root of the equation  $xe^x - 3 = 0$  lies in the interval \_\_\_\_  
A)  $(0,1)$  ✓ B)  $(1,2)$   
C)  $(2,3)$  D)  $(-1,0)$

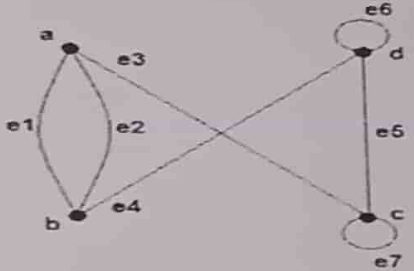


10. The Newton- Raphson formula to find the  $(n + 1)^{th}$  approximation to the root of  $f(x) = 0$  is :
- A)  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$  B)  $x_{n+1} = x_n + \frac{f(x_n)}{f'(x_n)}$   
 C)  $x_{n+1} = x_n - \frac{f'(x_n)}{f(x_n)}$  D)  $x_{n+1} = x_n - \frac{f''(x_n)}{f'(x_n)}$
11. The method which approximates the curve of the tangent to find root of an algebraic equation is
- A) Regula Falsi Method B) Newton-Raphson Method  
 C) Euler's Method D) Taylor's Method
12. For the heat equation  $u_t = 0.5u_{xx}$ ,  $h = k = 1$ , the value of mesh ratio parameter  $\alpha$  is .....
- A) 1 B) 0.5  
 C) 0.25 D) 2
13. The Fourier series expansion of  $x^3$  in the interval  $-1 \leq x \leq 1$ , periodic with  $f(x + 2) = f(x)$  has:
- A) Only Sine terms B) Only Cosine terms  
 C) Both Sine and Cosine terms D) Only Sine terms and a non-zero constant
14. The Fourier series expansion of the function  $f(x)$  in the interval  $(\alpha, \alpha + 2L)$  is
- A)  $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos(nx) + \sum_{n=1}^{\infty} b_n \sin(nx)$  B)  $\frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\left(\frac{n\pi x}{L}\right) + \sum_{n=1}^{\infty} b_n \sin\left(\frac{n\pi x}{L}\right)$   
 C)  $\frac{a_0}{2} + \sum_{n=0}^{\infty} a_n \cos\left(\frac{n\pi x}{L}\right) + \sum_{n=0}^{\infty} b_n \sin\left(\frac{n\pi x}{L}\right)$  D)  $a_0 + \sum_{n=0}^{\infty} a_n \cos(nx) + \sum_{n=0}^{\infty} b_n \sin(nx)$
15. Which of the following functions is odd
- A)  $-x - x^3$  B)  $\sin x^2 + x^5$   
 C)  $\cos 5x + 3e^{-x}$  D)  $e^{-x} + e^x$
16. Fourier transform of the function  $f(t) = \dots\dots\dots$
- A)  $\int_{-\infty}^{\infty} f(t)e^{-\omega t} dt$  B)  $\int_0^{\infty} f(t)e^{-i\omega t} dt$   
 C)  $\int_{-\infty}^{\infty} f(t)e^{-i\omega t} dt$  D)  $\int_0^{\infty} f(t)e^{-\omega t} dt$
17.  $Z(a^{nt})$  where  $a, t$  are constants is:
- A)  $\frac{z}{z + a^t}$  B)  $\frac{z}{z - a^t}$   
 C)  $\frac{z}{z + a^{-t}}$  D)  $\frac{z}{z - a^{-t}}$
18. If  $Z(u_n) = U(z)$ , then  $Z(-u_n)$  is :
- A)  $U(-z)$  B)  $-U(z)$   
 C)  $U\left(-\frac{1}{z}\right)$  D)  $U\left(\frac{1}{z}\right)$
19. 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)  $a Z(u_n) + \frac{bZ(v_n)}{c} Z(w_n)$  B)  $a Z(u_n) + bZ(v_n) - c Z(w_n)$   
 C)  $a Z(u_n) - bZ(v_n) - c Z(w_n)$  D)  $a Z(u_n) bZ(v_n) c Z(w_n)$
20. If  $Z(u_n) = U(z)$  then  $\lim_{z \rightarrow \infty} U(z)$  is :
- A) 0 B)  $\infty$   
 C)  $u_0$  D)  $u_1$

**PART - B: DESCRIPTIVE ANSWER QUESTIONS****Unit – I**

|                                                                                                                                                                                                                                                                                                                                                                                          | Marks | BT* | CO* | PO* |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|-----|-----|
| 1. a) Using rules of Inference, Show that the premises "If you send me an e-mail message, then I will finish writing the program," "If you do not send me an e-mail message, then I will go to sleep early," and "If I go to sleep early, then I will wake up feeling refreshed" lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed." | 6     | L*2 | 1   | 1   |
| b) Use mathematical induction to show $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$ for all non-negative integers $n$ .                                                                                                                                                                                                                                                                      | 6     | L2  | 1   | 2   |
| c) Let $p$ and $q$ be the propositions "The election is decided" and "The votes have been counted," respectively. Express each of these compound propositions as an English sentence.<br>i) $\neg p$ ii) $p \vee q$ iii) $\neg p \wedge q$ iv) $q \rightarrow p$                                                                                                                         | 4     | L3  | 1   | 1   |
| 2. a) Define tautology and contingency. By constructing a truth table verify the statement $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is a tautology or not?                                                                                                                                                                                           | 6     | L1  | 1   | 1   |
| b) Prove that $\sqrt{2}$ is irrational by giving proof by contradiction.                                                                                                                                                                                                                                                                                                                 | 6     | L2  | 1   | 2   |
| c) Show that the propositions $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalence.                                                                                                                                                                                                                        | 4     | L2  | 1   | 1   |

**Unit – II**

|                                                                                                                                                                                                                                                                                                                             |   |        |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------|---|---|
| 3. a) Let $A = \{1, 2, 3, 4, 5, 6\}$ , $R$ be a relation on $A$ defined by $aRb$ if and only if $b$ is a multiple of $a$ . i) Find a relation $R$ ii) Give the matrix representation of $R$ iii) Draw the digraph of $R$ iv) Find the in-degree and out-degree of every vertex of $R$ v) Find the domain and range of $R$ . | 6 | L1     | 2 | 1 |
| b) Let $A = \{1, 2, 3, 4\}$ and let $R = \{(1, 2), (2, 3), (3, 4), (2, 1)\}$ . Find the transitive closure of $R$ using Warshall's algorithm.                                                                                                                                                                               | 6 | L2     | 2 | 2 |
| c) Write the adjacency matrix and incidence matrix of the following graph.                                                                                                                                                                                                                                                  |   |        |   |   |
|                                                                                                                                                                                                                                          |   |        |   |   |
| 4. a) Determine whether the following relation $R$ on a set $A$ is an equivalent relation or not?<br>$A$ = set of real numbers; $aRb$ if and only if $a^2 + b^2 = 4$ .                                                                                                                                                      | 6 | L1     | 2 | 1 |
| b) State handshaking theorem. Prove that undirected graph has an even number of vertices of odd degree.                                                                                                                                                                                                                     | 6 | L2     | 2 | 1 |
| c) Define odd and even permutations.<br>i) determine whether the permutation<br>$p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 4 & 2 & 1 & 6 & 5 & 8 & 7 & 3 \end{pmatrix}$ is even or odd<br>ii) Find $p^2$ .                                                                                                       | 4 | L1, L2 | 2 | 2 |

## Unit – III

5. a) Using Modified Euler's method find an approximate value of  $y$  when  $x = 0.2$ , given that  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$  and  $h = 0.2$ . Carry out 3 iterations.
- b) Solve Laplace equation  $u_{xx} + u_{yy} = 0$  for  $0 < x < 1$ ,  $0 < y < 1$ ;  $u(x, 0) = u(0, y) = 0$ ;  $u(x, 1) = 6x$ ;  $0 < x \leq 1$ ,  $u(1, y) = 3y$ ,  $0 < y < 1$ . Divide the region into 9 square meshes.
- c) Find the root of the equation  $5x = e^x$  in  $(0, 1)$ , using Regula-Falsi method correct to four decimal places. Carry out 4 iterations.
6. a) Using Runge-Kutta method solve the initial value problem  $10y' = x^2 + y^2$ ,  $y(0) = 1$ , find  $y(0.1)$  taking  $h = 0.1$ .
- b) Find the value of  $u(x, t)$  satisfying the equation  $\frac{\partial u}{\partial t} = 4 \frac{\partial^2 u}{\partial x^2}$  and the boundary condition  $u(0, t) = 0 = u(8, t)$ ;  $u(x, 0) = 4x - \frac{1}{2}x^2$ ;  $x = i$ ,  $i = 0, 1, 2, 3, 4, 5, 6, 7, 8$ ,  $t = \frac{1}{8}j$ ,  $j = 0, 1, 2, 3, 4, 5$ .
- c) Find an approximate value of  $y$  when  $x = 0.1$ , if  $y' = x^2y - 1$ ,  $y(0) = 1$  and  $h = 0.1$ . Using Taylor's series method upto third degree terms.

|   |    |   |   |
|---|----|---|---|
| 6 | L1 | 3 | 2 |
| 6 | L3 | 3 | 1 |
| 4 | L2 | 3 | 1 |
| 6 | L3 | 3 | 1 |
| 6 | L1 | 3 | 1 |
| 4 | L1 | 3 | 1 |

## Unit – IV

7. a) Find the Fourier Series expansion of  $f(x) = \begin{cases} 0 & -2 < x < 0 \\ 1 & 0 < x < 2 \end{cases}$ ;  $f(x+4) = f(x)$ .
- b) Find the Fourier series for  $f(x) = e^{-x}$  in the interval  $0 < x < 2\pi$ .
- c) Find the half range Fourier cosine series of  $f(x) = x^2$  in  $0 \leq x \leq \pi$ .
8. a) Find the Fourier transforms of  $f(x) = e^{-a|x|}$ .
- b) State and prove convolution theorem for Fourier transforms.
- c) Find the Fourier sine transform of  $\frac{e^{-ax}}{x}$ ,  $a > 0$ .

|   |    |   |   |
|---|----|---|---|
| 6 | L3 | 4 | 1 |
| 6 | L2 | 4 | 1 |
| 4 | L1 | 4 | 1 |
| 6 | L1 | 4 | 1 |
| 6 | L3 | 4 | 2 |
| 4 | L1 | 4 | 1 |

## Unit – V

9. a) Find the Z-transform of  
i)  $\cos n\theta$  ii)  $\sin n\theta$
- b) State and prove convolution theorem for Z-transform.
- c) Find Z-transform of  $(2^n + 2^n n + 3^{-n} n + 3)$ .
10. a) Find the inverse Z-transform of  $\frac{z^2}{(z^2 - 7z + 12)}$ .
- b) Using Z-transform solve the difference equation  $u_{n+2} - 4u_n = 0$ , given  $u_0 = 0$  and  $u_1 = 2$ .
- c) Prove that  $Z_T(n^k) = -z \frac{d}{dz} (Z_T(n^{k-1}))$ , where  $k$  is a positive integer.

|   |     |   |   |
|---|-----|---|---|
| 6 | L1  | 5 | 1 |
| 6 | L1, |   |   |
| 6 | L3  | 5 | 2 |
| 4 | L1  | 5 | 1 |
| 6 | L2  | 5 | 1 |
| 6 | L2  | 5 | 1 |
| 4 | L1  | 5 | 1 |

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