

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 - II, April 2025**  
**MA1007-1 – DISCRETE MATHEMATICS AND TRANSFORM TECHNIQUES**  
 (For AD, AM, CB, CC, CS, IS, RI)

Duration: 1 Hour

Max. Marks: 20

**Part – A: Multiple Choice Questions**

*Note: Answer all Four questions in the Answer Book. Each question carries equal marks.*

- The method which approximates curve as tangent to find root of an algebraic equation is:  
 A) Newton-Raphson method  
 B) Regula-Falsi method  
 C) Runge-Kutta method  
 D) Modified Euler's method
- The Modified Euler's iteration formula to find better approximation of  $y_1$  of the first order ordinary differential equation is:  
 A)  $y_1^{(n+1)} = y_0 - \frac{h}{2} [f(x_0, y_0) + f(x_1, y_1^{(n)})]$   
 B)  $y_1^{(n+1)} = y_0 + h [f(x_0, y_0) + f(x_1, y_1^{(n)})]$   
 C)  $y_1^{(n+1)} = y_0 + \frac{h}{2} [f(x_0, y_0) + f(x_1, y_1^{(n)})]$   
 D)  $y_1^{(n+1)} = y_0 + \frac{h}{2} [f(x_0, y_0) + f(x_1, y_1^{(n)})]$
- If  $f(x)$  is defined in  $(-\pi, \pi)$ , then the Fourier coefficient  $a_0$  is  
 A)  $\int_0^{2\pi} f(x) dx$   
 B)  $\frac{1}{\pi} \int_{-\pi}^{\pi} f(x) dx$   
 C)  $\frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx dx$   
 D)  $\frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \sin nx dx$
- The Fourier series expansion of an odd periodic function contains  
 A) Only cosine terms  
 B) Only constant term  
 C) Only sine terms  
 D) Both constant and cosine terms

**Part – B: Descriptive Answer Questions**

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

**Unit – I**

- |   | Marks | BT* | CO* | PO* |
|---|-------|-----|-----|-----|
| 1. a) Find a real root of the equation $x^3 - 2x - 5 = 0$ in the interval $(2, 3)$ , using regula-falsi method. Carry out three iterations.   | 4     | L*2 | 3   | 2   |
| b) Using Fourth order Runge -Kutta method, find $y(0.1)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$ , take $h = 0.1$ .  | 4     | L3  | 3   | 1   |
| 2. a) Find a real root of the equation $\cos x = xe^x$ , using Newton-Raphson method near $x_0 = 1$ . Carry out three iterations.   | 4     | L2  | 3   | 2   |
| b) Use Taylor's series method to find the value of $y$ at $x = 0.1$ , given that $\frac{dy}{dx} = x^2y - 1$ , $y(0) = 1$ , take $h = 0.1$ . Expand upto 3 <sup>rd</sup> degree terms. | 4     | L3  | 3   | 2   |

**Unit – II**

- |   |   |    |   |   |
|---|---|----|---|---|
| 3. a) Solve the equation $u_{xx} + u_{yy} = 0$ under the conditions $u(0, y) = u(x, 0) = 0$ ; $u(3, y) = 3 + y$ ; $u(x, 3) = 2x$ for $0 \leq x < 3$ and $0 \leq y \leq 3$ , take $h = 1$ .  | 4 | L3 | 3 | 1 |
| b) Express $f(x) = 3x^2$ with $f(x + 2\pi) = f(x)$ as a Fourier series in the interval $(-\pi, \pi)$ .  | 4 | L3 | 4 | 2 |
| 4. a) Solve the boundary value problem $u_t = u_{xx}$ under the conditions $u(0, t) = u(1, t) = 0$ and $u(x, 0) = \sin \pi x$ , $0 \leq x \leq 1$ using Bendre-Schmidt relation. Carryout computations for two levels, taking $h = 0.2$ , $k = 0.02$ and $\alpha = \frac{1}{2}$ . | 4 | L3 | 3 | 2 |
| b) Find the Fourier series expansion of the function $f(x) = \begin{cases} 0 & -1 < x < 0 \\ x & 0 < x < 1 \end{cases}$ and $f(x + 2) = f(x)$ .   | 4 | L3 | 4 | 1 |

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Off-Campus Centre of Nitte (Deemed to be University)  
**II Sem B.Tech (CBCS) Mid Semester Examinations - II, April 2025**

**CS1005-2 – INTRODUCTION TO PYTHON PROGRAMMING**  
(For AD, AM, CB, CC, CS, IS, RI)

Duration: 1 Hour

Max. Marks: 20

**Part – A: Multiple Choice Questions** (1\*4 = 4 marks)

Note: Answer all **Four** questions in the **Answer Book**. Each question carries equal marks.

1. What will be the output of the following Python code? `print("xyzyxzyxzy".count('yy'))`  
 A) 0  
 B) 3  
 C) 2  
 D) Error
2. What will happen if you try to access a dictionary key that does not exist?  
 A) Returns None  
 B) Raises a KeyError  
 C) Creates a new key with None as value  
 D) Returns an empty dictionary
3. Which of the following is an immutable data type in Python?  
 A) List  
 B) Tuple  
 C) Set  
 D) Dictionary
4. Which of the following is the correct way to define a class in Python?  
 A) `class MyClass {}`  
 B) `MyClass():`  
 C) `class MyClass:`  
 D) `MyClass class()`

**Part – B: Descriptive Answer Questions** (2\*8 = 16 marks)

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

		Marks	BT*	CO*	PO*
<b>Unit – I</b>					
1. a)	Explain the following with example i. <code>fromkeys()</code> ii. <code>setdefault()</code> iii. <code>add()</code> iv. <code>items()</code>	04	L2	3	1
b)	Write a Python program to create a list of 5 integers, print their sum, and reverse the list without using the <code>reverse()</code> method.	04	L3	3	2
2. a)	How do you create a text file in Python? Explain with an example and describe any four modes available for opening a file.	04	L1	4	1
b)	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.	04	L3	3	2
<b>Unit – II</b>					
3. a)	Define a class and an object in Python with an example, and explain the role and significance of the <code>__init__</code> method.	04	L2	4	2
b)	Write a Python program to read a list of n integers. Create 2 new lists, one with all even numbers and the other with all odd numbers from the given list. Print all 3 lists.	04	L3	3	1
4. a)	What are the key differences between a list, tuple, and dictionary in Python?	04	L2	3	1
b)	Write a Python program that takes a string input from the user and performs the following operations: a. Count the number of characters in the string and display the result. b. Check if the string contains the word "python" (case-insensitive) and display the result as True or False. c. Split the string into a list of words and display the result. d. Join the list of words using a hyphen "-" as a separator and display the result.	04	L3	4	1

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**EC1002-2 – APPLIED DIGITAL LOGIC DESIGN**

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

Duration: 1 Hour

Max. Marks: 20

**Part – A: Multiple Choice Questions** (1\*4 = 4 marks)

*Note: Answer all **Four** questions in the **Answer Book**. Each question carries equal marks.*

1. The characteristic equation for S-R flip flop is  
 A)  $S + \bar{R}Q$  B)  $\bar{S} + \bar{R}Q$   
 C)  $S + \bar{R}\bar{Q}$  D)  $S + RQ$
2. How many combinations of inputs are possible for an 8-bit input encoder?  
 A)  $2^8$  B) 2  
 C)  $2^4$  D) 8
3. In a J-K flip-flop, if J=K the resulting flip-flop is referred to as  
 A) D Flip-flop B) T Flip-flop  
 C) JK Flip-flop D) SR Flip-flop
4. If A, B, and C are the inputs of a full adder then the carry is given by  
 A) (A AND B) OR (A AND B) C B) A OR B OR (A AND B) C  
 C) A AND B OR (A OR B) AND C D) A XOR B XOR (A XOR B) AND C

**Part – B: Descriptive Answer Questions** (2\*8 = 16 marks)

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

		Unit – I			
		Marks	BT*	CO*	PO*
1.	a) Design a half subtractor and full subtractor using basic gates.	5	L2	3	1
	b) Write a truth table for a combinational logic circuit to generate an output of logic 1 whenever the result of the multiplication of two numbers of 2 bits each is non-zero. Implement it using an 8:1 multiplexer.	3	L3	3	1
2.	a) Implement the following expressions using 4:1 multiplexer (i) $f(a,b) = \sum m(1,2)$ (ii) $f(a,b) = a + b$ (iii) $f(a,b,c) = a + b + c$ (iv) $f(x,y,z) = \sum m(0,2,3,4)$ (v) $f(x,y,z) = \prod M(0,3,4)$	5	L3	3	1
	b) Write a truth table for a three-input, one-output combinational circuit that has a logic-1 output when the majority of its inputs are logic-0 and a logic-0 output when the majority of its inputs are logic-1. Implement it using a 3 to 8-line decoder.	3	L2	3	1
		Unit – II			
3.	a) With a neat block diagram, symbol and function table, explain the operation of the Master-Slave JK flip-flop.	5	L2	4	1
	b) With the help of a block diagram, write the difference between combinational and sequential circuits. Give two examples for each.	3	L2	4	1
4.	a) Explain the working of the SR latch using a function table, symbol and logic diagram. Also, show how the SR latch can be modified to a D latch.	5	L2	4	1
	b) Derive the characteristic equation for JK and D flip-flop.	3	L2	4	1

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**EE1001-2- BASIC ELECTRICAL ENGINEERING**

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

Duration: 1 Hour

Max. Marks: 20

**PART-A: Multiple Choice Questions (1X4 = 4 Marks)**

*Note: Answer all Four questions in the answer book. Each question carries one mark.*

1. **Mutually induced emf is produced when**
  - A) The current in a coil changes
  - B) The current in a nearby coil changes
  - C) A magnet moves near a coil
  - D) A coil moves in a magnetic field
2. **A DC series motor has**
  - A) High starting torque
  - B) Constant speed
  - C) Low starting torque
  - D) Low speed regulation
3. **The principle of operation of a transformer is based on:**
  - A) Kirchoff's Law
  - B) Lenz's Law
  - C) Mutual induction
  - D) Self-induction
4. **A rotating magnetic field is produced in a three-phase induction motor by**
  - A) Three-phase AC supply
  - B) Single-phase AC supply
  - C) DC supply
  - D) None of the above

**PART-B: Descriptive Answer Questions (2X8=16 Marks)**

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

**Unit – I**

- |   | Marks | BT* | CO* | PO*  |
|---|-------|-----|-----|------|
| 1. a) A four-pole lap wound 400 V series motor has the following data: Number of armature conductors = 920, flux/pole = 0.045 Wb, total motor resistance = 0.6-ohm, iron and friction losses = 2kW. If current taken by the motor is 70A, find: (i) Total torque (ii) Useful torque at the shaft. | 5     | L*3 | 3   | 1, 2 |
| b) With a neat diagram explain the principle of operation of a DC motor.  | 3     | L2  | 3   | 1, 2 |
| 2. a) Explain with a neat diagram squirrel cage rotor and phase wound rotor of a three phase induction motor.   | 5     | L2  | 3   | 1,2  |
| b) A six pole wave connected DC generator has 960 armature conductors and flux per pole 0.04 Wb. Find the speed of the generator to generate 400 V.   | 3     | L3  | 3   | 1, 2 |

**Unit – II**

- |  |   |    |   |     |
|--|---|----|---|-----|
| 3. a) A 50kVA, 50Hz, 2000/200V transformer has iron and copper loss of 350 W and 400 W respectively. Determine (a) the number of turns in each winding for a maximum core flux of 0.05 Wb, (b) efficiency at half-rated kVA, and unity power factor.   | 5 | L3 | 4 | 1,2 |
| b) Explain various losses that occur in a single-phase transformer.  | 3 | L2 | 4 | 1,2 |
| 4. a) Explain the construction and working of a single-phase transformer.  | 5 | L2 | 4 | 1,2 |
| b) A single phase 50 Hz transformer has 80 turns on the primary winding and 400 turns on the secondary winding. The net cross sectional area of the core is 200 cm <sup>2</sup> . If the primary winding is connected to 230 V supply, determine:<br>(i) The e.m.f. induced in the secondary winding<br>(ii) Maximum value of the flux density in the core | 3 | L3 | 4 | 1,2 |

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