

2026

MATHEMATICS — HONOURS

Paper : SEC-2

(Python Programming and Introduction to LaTeX)

Full Marks : 75

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

Group - A

[Python Programming]

(Marks : 50)

1. Answer *any five* questions :

- (a) Write a Python program to find minimum of three number. 3
- (b) For data = [8, 3, 6, 1, 9], write statements to obtain the last two elements and to replace 6 by 10. 1+2
- (c) Write a Python program that accepts the radius of a circle and prints its area and circumference. 3
- (d) What will be output of the following code? 3
- ```
a = [1, 5, 3, 4]
b = [1, 2, 5]
print (a>b)
print (a+b)
print (a[::-1])
```
- (e) Using SymPy, evaluate the symbolic expression  $2x^2 + 3xy - y^2$  for  $x = 1.5$  and  $y = 2$ . 3
- (f) Use SymPy to simplify the expression  $\frac{(x^4 - 1)}{(x - 1)(x + 1)}$ . 3
- (g) Write the appropriate Python code to extract the following string from s = 'Python and Latex' :
- (i) and Latex (ii) PYTHON AND LATEX (iii) Python. 1+1+1

Please Turn Over

(7460)

2. Answer **any seven** questions :

- (a) Write the output of the following code :

5

```

i, j, k = 3, 0, -2
v = i and k
w = i or j or k
x = i and j and k
y = i or j and k
z = i and j or k
print(v, w, x, y, z)

```

- (b) Explain with examples the list operations : (i) insert(), (ii) remove(), (iii) reverse().

5

- (c) Determine the outputs :

(i) print('Hi'\*3)

(ii) print(len('Python'))

(iii) print(25//4 + 25%4 + 2\*\*3).

2+1+2

- (d) Write a Python code to compute
- $S = \sum_{n=1}^{30} \frac{1}{u_n^2 + 1}$
- ,

where  $u_1 = 1$ ,  $u_2 = 1$  and  $u_{n+1} = u_n + u_{n-1}$ ,  $n \geq 2$ .

5

- (e) Write a Python program to generate a list of all integers between 1 and 1000 which are not divisible by 2, 3, 5. Print the list.

5

- (f) Write a program in Python without using inbuilt function to sort the elements of a list in ascending order.

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- (g) (i) Write Python codes to solve the following equations using SymPy :

 $x + 5y + z = 1$  and  $x - 3y + 2z = 3$ .(ii) Write the Python code to find a value of  $x$  where  $\sin(x) = \cos(x)$  using SymPy.

3+2

- (h) Plot the functions
- $f(x) = x^2$
- and
- $g(x) = \exp(x)$
- on the same graph over the interval
- $[-2, 2]$
- using a dashed line for
- $f(x)$
- and a dotted line for
- $g(x)$
- . Also, add labels to the axes and a title to the graph.

2+2+1

- (i) Write a Python function that takes two lists and returns True if they have at least one common member and print all common elements.

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(3)

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(j) What will be the output of the following program?

(i) `list1=[[11, 12, 13, 14], [15, 16, 18]]`

`print(list1[1][2])`

(ii) `sum, n=0,1`

`while n<=10:`

`sum +=n`

`n+=2`

`print(sum)`

(iii) `for x in set ('pqr'):`

`print(x*2).`

1+2+2

**Group - B**

**[Introduction to LaTeX]**

**(Marks : 25)**

3. Answer **any five** questions :

2×5

(a) Which package is commonly used for mathematical symbols and colouring of text in a LaTeX document?

(b) Write LaTeX code to typeset the definite integral :

$$\int_0^{\pi} \sin(x) dx = 2$$

(c) Write the LaTeX command to typeset the fraction  $\frac{a+b}{c+d}$  and cube root  $\sqrt[3]{x+y}$ .

(d) Mention any one optional argument with its use that can be given in `\documentclass{article}` command.

(e) Write the command in LaTeX to write the following equation involving determinant :

$$M_{12} = \begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix}$$

(f) Write a block of LaTeX code to display the following table :

|   |    |    |
|---|----|----|
|   | O1 | O2 |
| X | 87 | 77 |
| Y | 79 | 82 |

**Please Turn Over**

**(7460)**

(g) What is the output of the following command :

`\prod_{n=0}^{\infty} \left(1+2^{-2^n}\right)`

4. Answer **any three** questions :

(a) Write the LaTeX source code of the following 4 lines :

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(i) The moment of inertia ( $I$ ), is  $I = \frac{1}{2}mr^2$ .

(ii) I am a student of **B.Sc. Course**.

(iii) The angle of the prism is,  $\frac{\pi}{3}$ .

(iv) The resistance of a filament,  $R_t = R_0(1 + \alpha t + \beta t^2)$ .

(b) Write codes in LaTeX to typeset the following :

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$$x_2^n = 1 + \frac{1}{2} + \left(\frac{1}{3} + \frac{1}{4}\right) + \dots + \left(\frac{1}{2^{n-1}} + \dots + \frac{1}{2^n}\right) \\ > 1 + \frac{1}{2} + \left(\frac{1}{4} + \frac{1}{4}\right) + \dots + \left(\frac{1}{2^n} + \dots + \frac{1}{2^n}\right).$$

(c) Write a code in LaTeX to produce the output :

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$$f(x) = \begin{cases} x^2, & 0 \leq x \leq 2, \\ -x^2, & -2 \leq x < 0, \\ 0, & \text{otherwise.} \end{cases}$$

(d) Write a block of LaTeX code to display :

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$$x + y + z = 6$$

$$a - b + 2c = 3$$

$$2p - q + r = 5$$

(e) Write a block of LaTeX code to display the following table :

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|         | Maths | Physics | Chemistry |
|---------|-------|---------|-----------|
| Rian    | 87    | 77      | 93        |
| Jamima  | 79    | 82      | 78        |
| Rituraj | 66    | 59      | 71        |
| Shrenka | 59    | 77      | 70        |