UNIVERSITY OF CALCUTTA · Previous Year Question Paper

2026

MATHEMATICS — HONOURS

Paper: SEC-2.1

(Python Programming and Introduction to LaTeX)

Full Marks: 75

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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 $\dfrac{(x^4 - 1)}{(x-1)(x+1)}$. **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**

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. **5**

(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. **5**

(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

(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 : **5**

(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 : **5**

$$\begin{aligned} x_{2^n} &= 1 + \frac{1}{2} + \left(\frac{1}{3} + \frac{1}{4}\right) + \cdots + \left(\frac{1}{2^{n-1}} + \cdots + \frac{1}{2^n}\right) \\ &> 1 + \frac{1}{2} + \left(\frac{1}{4} + \frac{1}{4}\right) + \cdots + \left(\frac{1}{2^n} + \cdots + \frac{1}{2^n}\right). \end{aligned}$$

(c) Write a code in LaTeX to produce the output : **5**

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

(d) Write a block of LaTeX code to display : **5**

$$\begin{aligned} x + y + z &= 6 \\ a - b + 2c &= 3 \\ 2p - q + r &= 5 \end{aligned}$$

(e) Write a block of LaTeX code to display the following table : **5**

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

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