

*Total number of printed pages-12*

**3 (Sem-4/CBCS) MAT SE1/2**

**2022**

**MATHEMATICS**

**(Skill Enhancement Course)**

**Answer the Questions from any one Option.**

**OPTION - A**

**(*LaTeX and HTML*)**

Paper : MAT-SE-4014

**OPTION - B**

**(*R-Programming*)**

Paper : MAT-SE-4024

*Full Marks : 50*

Time : Two hours

***The figures in the margin indicate  
full marks for the questions.***

***Answer either in English or in Assamese.***

*Contd.*

## OPTION - A

Paper : MAT-SE-4014

(*LaTeX and HTML*)

1. Answer **any four** questions :  $1 \times 4 = 4$

- (a) What do you mean by LaTeX ?
- (b) What do you mean by preamble in a LaTeX document ?
- (c) What are the LaTeX commands for the Greek letters  $\varepsilon$  and  $\gamma$  ?
- (d) Write the LaTeX command for  $A \cap B$ .
- (e) What is beamer ?
- (f) Which document class do we use in the preamble of a beamer document ?
- (g) What does HTTP stand for ?
- (h) What does the `<body>... </body>` section of a web page contain ?

2. Answer **any two** questions :  $3 \times 2 = 6$

(a) Make the following equation in LaTeX :

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

- (b) Write each of the following postfix expressions in standard form :

$\times \times \sin \text{ mul}$

$\times 1 \text{ add } 2 \text{ exp } 1 \times \text{ sub div}$

- (c) What is wrong with the following input ?  
What is the right way to do it ?  
If  $\theta = \pi$ , then  $\cos \theta = -1$

- (d) Write a simple LaTeX program to create a file containing an itemized list.

- (e) Write a simple LaTeX program to create a presentation with a title page and a second page containing a  $3 \times 3$  matrix.

- (f) Is the following HTML construction correct ? Justify.

`<p> This is <strong><em>bold and italics</em>.</p>`

3. Answer **any two** questions :  $5 \times 2 = 10$

- (a) Write the LaTeX command for the following :

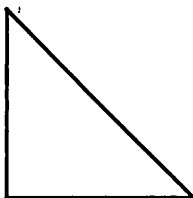
$$1 + 2 = 3$$

$$4 + 5 + 6 = 7 + 8$$

$$9 + 10 + 11 + 12 = 13 + 14 + 15$$

$$16 + 17 + 18 + 19 + 20 = 21 + 22 + 23 + 24$$

- (b) Use LaTeX picture environment to make a picture of a Pythagorean triangle of sides 3,4,5 as shown below and put the inscribed triangle :



- (c) What is PSTricks in LaTeX ? Write the use of the following commands :

`\psset`, `\psline`, `\pscircle`, `\psclip`

- (d) Write the output of the following LaTeX code :

```
\begin{pspicture}(4,4)
\pscircle(2,2){1.5}
\pswedge[fillstyle=solid,fillcolor=lightgray](2,2){1.5}{0}{60}
\put(2.75,1.7){$r$}
\put(2.3,2.1){$\theta$}
\put(3.25,3){$A=r\theta$}
\end{pspicture}
```

- (e) Write a simple program in LaTeX to create a presentation containing the title page and a second page containing a PSTricks picture of a square.

(f) What are the basic elements of HTML ?  
Write the uses of these basic elements.

4. Answer **any three** questions :  $10 \times 3 = 30$

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

```

\documentclass{article}
\title{My Document}
\author{A. Student}
\begin{document}
\maketitle
\begin{enumerate}
\item Let  $\mathbf{x} = (x_1, \dots, x_n)$ , where the  $x_i$  are nonnegative
real numbers. Set
\begin{equation*}
M_r(\mathbf{x}) = \left( \frac{x_1^r + x_2^r + \dots + x_n^r}{n} \right)^{1/r},
\quad ; r \in \mathbf{R} \setminus \{0\},
\end{equation*}
and
\begin{equation*}
M_\theta(\mathbf{x}) = \left( x_1 x_2 \dots x_n \right)^{1/n}.
\end{equation*}
We call  $M_r(\mathbf{x})$  the  $r$ th power mean
of  $\mathbf{x}$ .

```

(b) Plot  $y = \sin x$  and  $y = \cos x$  on the same coordinate system, for  $0 \leq x \leq 2\pi$ . Show the sine function as a solid curve and the cosine function as a dotted curve.

- (c) How to create arrays and multiline expressions in LaTeX ? Give examples of each in LaTeX code as well as the corresponding outputs.
- (d) Draw a graph consisting of two sets of three nodes and all nine possible line connections between the two sets.
- (e) Check for mistakes in the following LaTeX codes and correct them and produce the final output :

```
\documentclass{article}
```

```
\title{Differ entiability}
```

```
\begin{document}
```

```
\begin{frame}
```

```
\titlepage
```

```
\begin{frame}
```

Let  $f$  be a function defined in a neighbourhood of a point  $x_0$ .

Then  $f$  is differentiable at  $x_0$  if the following limit exists :

```
\begin{equation*}
```

$$\lim_{x \rightarrow x_0} \frac{f(x) - f(x_0)}{x - x_0}$$

```
\end{frame}
```

```
\end{equation*}
```

- (f) Describe how to put an image in a web page with the image aligned at the center. Give an example. How to use an image as a link ? Give an example.

(g) What does HTML stand for? Write HTML code to construct the following web page:

Here are the mathematical subjects offered :

- Differential equation
- LaTeX and HTML

The syllabus of each paper can be found at Gauhati University.

(Note : Here Gauhati University should be a link to an external website)

(h) Make a web page showcasing some of your mathematical interests.

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## OPTION - B

Paper : MAT-SE-4024

### (R-Programming)

1. Answer **any four** questions from the following : 1×4=4

তলৰ যিকোনো চাৰিটা প্ৰশ্নৰ উত্তৰ কৰা :

- (a) How do you assign a variable in R ?

R ত এটা চলকক কেনেকৈ নিৰ্দিষ্ট স্থানত বহুৱাব পাৰি?

- (b) Which function is used to create frequency table in R ?

বাৰংবাৰতা টেবুল তৈয়াৰ কৰাৰ বাবে R ত কি চলক ব্যৱহাৰ কৰা হয়?

- (c) How do you read a CSV file in R ?

R ত এটা CSV ফাইল কেনেকৈ পঢ়া হয়?

- (d) How are R commands written ?

R ত দেশ বোৰ কেনেকৈ লিখা হয়?

- (e) In R, how are missing values represented ?

R ত হেৰোৱা মানবোৰ কেনেকৈ প্ৰদৰ্শন কৰা হয়?

- (f) What is iPlots ?

iPlots কি?



(g) How do you list the preloaded dataset in R ?

অগতে অনুমোদন কৰা এটা সংহতৰ তথ্য বোৰ কেনেকৈ তালিকা কৰা হয় ?

(h) Give one advantage in R.

R ৰ এটা সুবিধা লিখা।

2. Answer **any three** questions from the following : 2×3=6

তলৰ যিকোনো তিনিটা প্ৰশ্নৰ উত্তৰ কৰা :

(a) What is the difference between 'lapply' and 'sapply' ?

'লেপলী' আৰু 'ছেপলী'ৰ পাৰ্থক্য কি ?

(b) Give an example of division of two numbers in R ?

R ত দুটা সংখ্যাৰ হৰণৰ উদাহৰণ দিয়া।

(c) What is the output of runif (5) ?

runif (5) ৰ output কি ?

(d) What are with ( ) and by ( ) function in R ?

R ত with ( ) আৰু by ( ) ফলন কি বুজায় ?

(e) Explain the use of scan function in R ?

R ত scan ফলনৰ বৰ্ণনা দিয়া।

(f) What is the use of seq ( ) function in R ?

R ত seq ( ) ফলনৰ ব্যৱহাৰ কি?

3. Answer **any two** questions from the following: 5×2=10

তলৰ যিকোনো দুটা প্ৰশ্নৰ উত্তৰ কৰা :

(a) Discuss the programming features in R.

R ৰ প্ৰোগ্ৰামিং বৈশিষ্ট্য আলোচনা কৰা।

(b) How would you write a custom function in R ? Give an example.

R প্ৰোগ্ৰামিংৰ ক্ষেত্ৰত এটা পৰম্পৰাগত ফলন কিদৰে লিখা হয় ? এটা উদাহৰণ দিয়া।

(c) What is a factor in R ? How would you create a factor in R ?

R ৰ ক্ষেত্ৰত ফেক্টৰ কি? R ত ফেক্টৰ কি ধৰনে সৃষ্টি কৰা হয়?

(d) Name some functions which can be used for debugging in R ?

R ত প্ৰোগ্ৰাম-ত্ৰুটি নোহোৱাইক ব্যৱহাৰ কৰা কিছুমান ফলনৰ নাম লিখা।

- (e) `x <- matrix (1 : 9, 3, 3)`  
`x`  
`# Scale (x)`  
`Scale (x)`  
 What is the output of the programme ?

উক্ত প্ৰগ্ৰামটোৰ আউটপুট কি ?

- (f) Explain about 'initialize ()' function in R ?

R ৰ ক্ষেত্ৰত 'initialize ()' ফলন বৰ্ণনা কৰা।

4. Answer **any three** questions from the following : 10×3=30

তলৰ যিকোনো তিনিটা প্ৰশ্নৰ উত্তৰ কৰা :

- (a) Write an R program to check whether a given number is prime.

মৌলিক সংখ্যা পৰীক্ষা কৰা R প্ৰগ্ৰামটো লিখা।

- (b) Write an R program to compute LCM of a set of numbers.

এটা সংখ্যা সংহতিৰ পৰা ল.সা.গু. উলিওৱা R প্ৰগ্ৰামটো লিখা।

- (c) Why is R programming used instead of MS-Excel for analysis of data.

তথ্য বিশ্লেষণৰ বাবে MS-Excel ৰ সলনি R প্ৰগ্ৰামিং কিয় ব্যৱহাৰ কৰা হয় ?

(d) Discuss about the components of R-studio.

R-স্টুডিওৰ উপাদানৰ বিষয়ে আলোচনা কৰা।

(e) What are the three sorting algorithms available in R ?

R ৰ ক্ষেত্ৰত পাৰলগীয়া শ্ৰেণীবদ্ধ এলগ'ৰিথম তিনিটা কি?

(f) (i) Mention how you can save work in R.

R ভাষাত কৰা কাম এটা কেনেকৈ save কৰি ৰাখিব পাৰি?

(ii) Explain how to export data from R.

R ৰ পৰা তথ্য কেনেকৈ পঠোৱা হয়।

(g) Write the name of all control statements present in R ?

R ত থকা সকলোবোৰ নিয়ন্ত্ৰণ উক্তিৰ নাম লিখা।

(h) (i) Explain the disadvantage in R.

R ত থকা অসুবিধাবোৰ লিখা।

(ii) List some of the functions that R provides.

R য়ে যোগান ধৰা কিছুমান ফলনৰ নাম লিখা।