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 : 1×4=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 ε and γ ?

   (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 : 3×2=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 :

   × × sin mul

   × 1 add 2 exp 1 × 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 3×3 matrix.

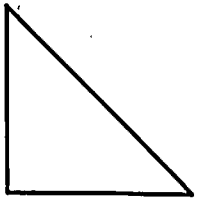
   (f) Is the following HTML construction correct ? Justify.
    This is bold and italics.

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

   (a) Write the LaTeX command for the following :

$$\begin{aligned} 1+2 &= 3 \\ 4+5+6 &= 7+8 \\ 9+10+11+12 &= 13+14+15 \\ 16+17+18+19+20 &= 21+22+23+24 \end{aligned}$$

(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 : 10×3=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 $\mathbf{x}=(x_1,\ldots,x_n)$, where the $x_i$ are nonnegative real numbers. Set
\begin{equation*}
M_r(\mathbf{x})=\left(\frac{x_1^r+x_2^r+\cdots+x_n^r}{n}\right)^{1/r},
\;\; r \in \mathbf{R} \setminus \{0\},
\end{equation*}
and
\begin{equation*}
M_0(\mathbf{x})=\left( x_1 x_2 \ldots x_n \right)^{1/n}.
\end{equation*}
We call $M_r(\mathbf{x})$ the \emph{$r$th power mean} of $\mathbf{x}$.
```

(b) Plot $y = \sin x$ and $y = \cos x$ on the same coordinate system, for $0 \le x \le 2\pi$. 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_{θ}.
Then $f$ is differentiable at x_{θ} if the following limit exists :
\begin{equation*}
\lim_{x\rightarrow x_{θ}}frac{f(x)-f(x_θ)}{x-x_θ}
\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.

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 প্ৰগ্ৰামিং বৈশিষ্ট্য আলোচনা কৰা।

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

R প্ৰগ্ৰামিংৰ 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 প্ৰগ্ৰাম-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* প্ৰগ্ৰোমটো 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-ষ্টুডিওৰ উপাদানৰ বিষয়ে আলোচনা কৰা।

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

R ৰ ক্ষেত্ৰত পাৱলগীয়া শ্ৰেণীবদ্ধ এলগ'ৰিথিম 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।
