

OPTION - B

Paper : MAT-SE-4024

(**LaTeX and HTML**)

1. Answer the following questions : $1 \times 4 = 4$

- (a) What is a markup language ?
- (b) What do you mean by preamble in a LaTeX document ?
- (c) What is the purpose of the command `\author` in LaTeX ?
- (d) What is beamer ?

2. Answer the following questions : $2 \times 3 = 6$

- (a) Make the following equation in LaTeX :

$$\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$$

- (b) Write the LaTeX command to produce the following matrix :

$$A = \begin{bmatrix} 1 & \alpha \\ 2 & \beta \end{bmatrix}$$

- (c) What is PSTricks ? How will you use PSTricks in a LaTeX document ?

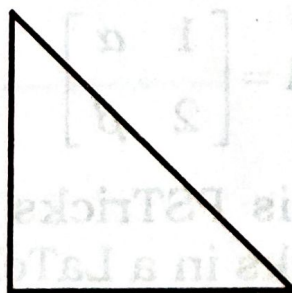
3. Answer **any two** questions :

5×2=10

(a) Write the LaTeX command for the following :

$$\begin{aligned} \prod_p \left(1 - \frac{1}{p^2} \right) &= \prod_p \frac{1}{1 + \frac{1}{p^2} + \frac{1}{p^3} + \dots} \\ &= \left(\prod_p \left(\frac{1}{1 + \frac{1}{p^2} + \frac{1}{p^3} + \dots} \right) \right)^{-1} \\ &= \left(1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots \right)^{-1} \\ &= \frac{6}{\pi^2} \end{aligned}$$

(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) 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){$A=e\theta$}
\end{pspicture}
```

- (d) 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.

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

- (a) What do you mean by LaTeX? Give examples of some LaTeX editors. Typeset the following in LaTeX :

- (i) Let $\gamma, \gamma_1, \gamma_2$ piecewise smooth curves in a domain D in $\mathbb{C}$. Show that

$$\int_{\gamma_1 \cup \gamma_2} f dz = \int_{\gamma_1} f dz + \int_{\gamma_2} f dz$$

$$\text{and } \int_{-\gamma} f dz = - \int_{\gamma} f dz$$

(ii) For $r > 0$, verify that

$$\left| \int_{\gamma} e^{iz^2} dz \right| \leq \frac{\pi(1 - e^{-r^2})}{4r}$$

(b) How to create arrays and multiline expressions in LaTeX? Give examples of each in LaTeX code as well as the corresponding outputs.

(c) Write LaTeX code to plot the cardioid given by the parametric equations :

$$x = \cos t (1 - \cos t)$$

$$y = \sin t (1 - \cos t), \quad 0 \leq t \leq 2\pi$$

On the same coordinate system, plot the function $f(x) = \sin 1/t$, $0 \leq t \leq 2\pi$ with this function shown as dotted curves.

(d) Check for mistakes in the following LaTeX codes and correct them and produce the final output :

```
\documentclass{article}
\title{My exam}
\begin{document}
\begin{frame}
\titlepage
\end{frame}
\begin{frame}
```

Let f be a function defined in a neighborhood of a point x_0 . Then f is continuous at x_0 if

```
\begin{enumerate}
\item  $\lim_{x \rightarrow x_0} f$  exists and
\item  $\lim_{x \rightarrow x_0} f(x) = f(x_0)$ 
\end{frame}
\end{document}
```

(e) Describe how to put an image in a webpage with the image aligned at the center. Give an example. How to use an image as a link? Give an example.

(f) What does HTML stand for? Write HTML code to construct the following webpage:

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)

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