

2025

MATHEMATICS

Paper : SEC-02-B-10-03

LaTeX

Full Marks : 30

Time : 1½ hrs

The figures in the margin indicate full marks for the questions

1. Answer the following questions: 1×5=5
 - a) What is a markup language?
 - b) What is the purpose of the command `\maketitle` in LaTeX?
 - c) What is the preamble in a LaTeX document?
 - d) Name some commands that can change the size of text.
 - e) What is the command to write $\{x\}$ in LaTeX?
2. Answer briefly **any five** of the following questions : 2×5=10
 - a) Make the following equation in LaTeX:
$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$
 - b) What is wrong with the following input? What is the right way to do it?
`\cos(theta)=sin(90^0-\theta)$`.
 - c) What is LaTeX? How to create a LaTeX file?
 - d) How to create a numbered list in LaTeX?

- c) Write commands to write the following matrix in LaTeX:

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

- f) What is PSTricks? Which command should be added to the preamble to use the PSTricks environment?
 g) What is beamer? Which documentclass is used to write a beamer document?
 h) How to include a already created graphics file (.jpg/.png) in a LaTeX file?
 i) What is wrong with the following LaTeX input ? What is the correct way to do it?
 If $m=1$ and $n=2$, then $m+n=3$.
 j) What is wrong with the following LaTeX input ? What is the correct way to do it?
 If $\theta = \pi$, then $\sin \theta = 0$.

3. Answer **any three** of the following questions: $5 \times 3 = 15$

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

$$\begin{aligned} (a+b)^2 &= (a+b)(a+b) \\ &= (a+b)a + (a+b)b \\ &= a^2 + ba + ab + b^2 \\ &= a^2 + ab + ab + b^2 \\ &= a^2 + 2ab + b^2 \end{aligned}$$

- b) Write the output of the following LaTeX codes:

(i) `\begin{eqnarray*}`

$$\lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n$$

`\right)^n=e`

`\end{eqnarray*}`

(ii) `\sum_{k=1}^n k = \frac{n(n+1)}{2}`

- (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) Use LaTeX's picture environment to make a picture of a 3–4–5 Pythagorean triangle.
 e) How to create arrays and multiline expressions in LaTeX? Give examples of each in LaTeX code as well as the corresponding outputs.
 f) Write LaTeX code to plot the cardioid given by the parametric equations:

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

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

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.
