Name of the Course: **B. Sc. (H) Mathematics CBCS(LOCF)**

Unique Paper Code: 32353301

Name of the Paper: **SEC : LaTeX and HTML**

Semester: **III**

Time: 2 Hrs   Maximum Marks: 38

Instructions for Candidates:

(i) This question paper has **six** questions in all.

(ii) Attempt any **four** questions.

(iii)All questions carry equal marks.

1.   (a) Write codes in LaTeX to typeset the following :

If B is any **square matrix** of order m, I is the mth order identity matrix and α is a scalar, then the **characteristic equation** of B is given as :

$$\left| B - \alpha I \right| = \begin{vmatrix} a_{11} - \alpha & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{22} - \alpha & \cdots & a_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mm} - \alpha \end{vmatrix} = 0.$$

(b) Write codes in LaTeX to typeset a filled ellipse of horizontal radius **a=3** and vertical radius **b=1** with center (1,1). Also label its radii and circumference.

(c) Write codes in HTML to create a web page showing the ordered list of the following subjects:

Calculus, Algebra, Real Analysis, Differential Equations, Group Theory

The font of the text in the list should be "italics".

2.   (a) Elaborate the LaTeX commands to draw straight lines, arrows, circles and ovals **using picture environment** with **at least one example** of each type.

(b) Write codes in HTML to create a web page consisting a link "**my interests**" and a photograph . Keep the background color of the page yellow.

(c) Write codes in LaTeX to create a **colorful** beamer presentation on an equilateral triangle   having at least **four** slides. Also, include a picture of the equilateral triangle.

3. (a) Write codes in LaTeX to typeset the following:

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

(b) Write the postfix expression for the following mathematical expressions:

(i) $\dfrac{2\sin^2 x+3x}{2y^3+5}$ (ii) $\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$.

(c) Write codes in LaTeX to create a **colorful beamer** presentation on solving the quadratic

equation $ax^2+bx+c=0$ with first slide being the title slide.

4. Find the errors and write the correct version in the following LaTeX source code (highlight your corrections in the answer). Also, write its output.

```
\documentclass{article}
\usepackage{amsmath}
\title{My Document}
\author{ABC}
\date{today}
\maketitle
\begin document
Suppose that $F(x,y)$ is differentiable and that the equation $ F(x,y)=0
defines y as a differentiable function of x. Then at any point where $F_y
neq 0$, then $$ frac{dy}{dx}=-frac{F_x}{F_y}.$
\end document
```

(b) Write codes in LaTeX to draw shaded sector of a circle **using** PSTricks. Also, label the radius and angle in the shaded sector.

(c) Write codes in HTML to create a web page displaying the solution of the equation

$x^2-4x+3=0$. Keep the font color of the given equation red.

5. (a) Write codes in LaTeX to **plot** graph of the f(x) given below. Also label the graph.

$$f(x) = \begin{cases} x^3 & if \ x > 0, \\ x^{-3} & if \ x < \ 0. \end{cases}$$

(b) Write codes in LaTeX to draw a circle and use HTML to create a web page containing these codes and picture of the circle.

(c) Write codes in LaTeX to create the following beamer presentation:

Continuous Function
Student
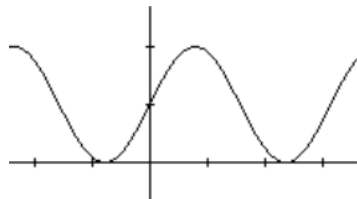University of Delhi
December, 2021

Introduction

In layman's language, a function is continuous when it's graph is simple unbroken curve i. e. you can draw its graph without lifting pen from the paper. Some examples of continuous functions are

1. Polynomial functions
2. Exponential functions
3. Trigonometric functions in some periodic interval etc.

Definition

Let $A \subseteq \mathbf{R}$,let $f : A \longrightarrow \mathbf{R}$ and let $c \in A$. We say that f is continuous at c if, given any number $\epsilon > 0$ there exists $\delta > 0$ such that if x is any point of A satisfying $|x - c| < \delta$, then $|f(x) - f(c)| < \epsilon.$

Example graph of a continuous function

For the **last slide** use the picture named "**continuous function.png**".

6. (a) What is the output of the following command :

$$\left(\sum_{i=0}^{\infty}a_i\right).\left(\sum_{j=0}^{\infty}b_j\right)= \sum_{k=0}^{\infty }\left(\sum_{l=0}^{k}a_lb_{k-l}\right)$$

(b) Write codes in LaTeX to typeset the following *list* :

    i. $\prod_{n=0}^{\infty}\left(1+2^{-2^n}\right)$

    ii. Let f be a function from $\mathbf{R}^2$ to $\mathbf{R}^2$

(c) Write codes in LaTeX to draw a picture of 5-12-13 Pythagorean triangle in the **picture environment.** Also, label the sides.