Graphic Era HILL UNIVERSITY
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University under section 2(f) of UGC Act, 1956

Term Evaluation (Even) Semester Examination June 2025

Roll No.....

Name of the Course : **Diploma**
Semester: II
Name of the Paper : **Applied Mathematics - II**
Paper Code : **DTMA-201**
Time : 3:00 hour Maximum Marks: 100

Note : (i) Answer all the questions by choosing any two of the sub-questions.
(ii) Each question carries 20 marks.

1. (a) Solve the following linear system of equations: **CO:1**(10 Marks)

$$\begin{aligned} 2x + 3y + 3z &= 5 \\ x - 2y + z &= -4 \\ 3x - y - 2z &= 3. \end{aligned}$$

(b) Verify Cayley Hamilton theorem for the matrix: **CO:1** (10 Marks)

$$A = \begin{bmatrix} 7 & 3 \\ 2 & 6 \end{bmatrix}.$$

(c) Find the eigen values of the following matrices: **CO:1** (10 Marks)

$$A = \begin{bmatrix} -5 & 2 & 3 \\ 0 & 4 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

and

$$B = \begin{bmatrix} 9 & 3 & 7 \\ 0 & -5 & 1 \\ 0 & 0 & 5 \end{bmatrix}.$$

2. (a) Let $\vec{a} = -6k - 3i - 4j$ and $\vec{b} = 7j - 9k + 6i$. Then find
(i) $2\vec{a} + 5\vec{b}$
(ii) $\vec{b} - \vec{a}$
(iii) $\vec{a} - \vec{b}$ **CO:2** (10 Marks)

(b) Let $\vec{x} = 9j - 8k - 2i$ and $\vec{y} = -6j - 2k - 9i$. Then find
(i) $\vec{x} \times \vec{y}$
(ii) $\vec{x} \cdot \vec{y}$ **CO:2** (10 Marks)

(c) State the Green's, Stokes and Gauss theorems. **CO:2** (10 Marks)

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3. (a) Find the n^{th} derivative of the folloeing functions:
(i) $y = x^8$
(ii) $y = e^{ax}$ **CO:3** (10 Marks)

(b) State Leibnitz's theorem. Using Leibnitz's theorem, find the n^{th} derivative of $xlogx$. **CO:3** (10 Marks)

(c) Find $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ and $\frac{\partial f}{\partial t}$ for the given function:
$f(x, y, t) = x^3 cosy - e^{-t} sinx + 5y^2x^6t^2$. **CO:3** (10 Marks)

4. (a) Find the Laplace transformation of the following functions:
(i) $sin(at)$ (ii) $cos(at)$ (iii) e^{at} **CO:4** (10 Marks)

(b) Find the inverse Laplace transformation of the following functions:
(i) $\frac{1}{s-3} + s + \frac{s}{s^2-4}$ (ii) $\frac{1}{s^2} + \frac{1}{s+4} + \frac{1}{s^2+4} + \frac{s}{s^2-9}$ **CO:4** (10 Marks)

(c) Define Beta function, Gamma function and Fourier series. **CO:4** (10 Marks)

5. (a) What is exact differential equation in first order. Check exactness of the following differential equations:
(i) $(x^2 - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$
(ii) $(x^3 - 2y^2e^x)dx + (e^xy^2 - 4xy)dy = 0$. **CO:5** (10 Marks)

(b) Define the following terms with example: **CO:5** (10 Marks)
(i) Ordinary differential equation
(ii) Order of differential equation
(iii) degree of differential equation

(c) What is second order differential equation. Solve the following second order differential equation: $(D^2 - 3D + 2)y = 0$. **CO:5** (10 Marks)