Graphic Era
HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

GEHU/04M/9.1.3

End Term (Back) Even Semester Examination May-June 2025
Batch 2023-2027

Roll n ..

Name of the Program and semester: **B.Tech** Semester: **II**
Name of the Course: **Engineering Mathematics II**
Paper Code: **TMA 201**
Time: 3:00 hour **Maximum Marks: 100**

Note:

(i) All questions are compulsory.
(ii) Answer any two sub parts of a question among *a*, *b* & *c*.
(iii) Total marks of each question are **twenty**.
(iv) Each sub part of a question carries **ten** marks.

Q1. $(10\times 2=20)$ Marks CO:1

a. Solve: $\left(x^2+y^2\right)dx+2xydy=0$

b. Solve: $\left(D^2-2D+1\right)y=x\sin x$.

c. Solve by the method of variation of parameters: $\dfrac{d^2y}{dx^2}+y=\operatorname{cosec}x$.

Q2. $(10\times 2=20)$ Marks CO:2

a. Evaluate $L\left[t^2e^{2t}\sin t\right]$.

b. Using convolution theorem prove that $L^{-1}\left\{\dfrac{s^2}{\left(s^2+a^2\right)\left(s^2+b^2\right)}\right\}=\dfrac{a\sin at-b\sin bt}{a^2-b^2}$

c. Solve the differential equation using Laplace transform method.
$\dfrac{d^2x}{dt^2}+9x=\cos 2t,\ \ x(0)=1,\ x\left(\dfrac{\pi}{2}\right)=-1$

Q3. $(10\times 2=20)$ Marks CO:3

a. Form a partial differential equation from $x^2+y^2+(z-c)^2=a^2$.

b. Solve the following differential equation $yq-xp=z$, where $p=\dfrac{\partial z}{\partial x},\ q=\dfrac{\partial z}{\partial y}$

c. Solve $px+qy=pq$ by using Charpit's method.

Q4. $(10\times 2=20)$ Marks CO:4

a. Solve $\dfrac{\partial^2 z}{\partial x^2}-3\dfrac{\partial^2 z}{\partial x\partial y}+2\dfrac{\partial^2 z}{\partial y^2}=e^{2x-y}+e^{x+y}+\cos(x+2y)$.

b. Solve $\dfrac{\partial u}{\partial x}=2\dfrac{\partial u}{\partial t}+u$; $u(x,0)=6e^{-3x}$

c. Find the temperature in a bar of length 2 whose ends kept at zero and lateral surface insulated if initial temperature is $\sin\dfrac{\pi x}{2}+3\sin\dfrac{5\pi x}{2}$.

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Q5. $(10\times 2 = 20)$ Marks CO:5

a. Expand the function $f(x) = x\sin x$, as a Fourier series in the interval $-\pi \le x \le \pi$.

b. Find the Fourier series expansion of the periodic function of period 2π.
$f(x) = e^{x}, \quad 0 < x < 2\pi$

c. Obtain the Fourier series expansion of $f(x) = \begin{cases} x, & 0 < x < \pi \\ -x, & -\pi < x < 0 \end{cases}$