Reg. No. : | | | | | | | | | | |

Question Paper Code:92005

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Second Semester

19UMA205- CALCULUS AND TRANFORMS TECHNIQUES

Electrical and Electronics Engineering

(Regulation 2019)

Duration: 1.45 hrs | Maximum: 100 Marks

PART A | 10*2 = 20 Marks

(Answer Any Ten of the following Questions)

1.	Compute the particular Integral $(D^2+16)y=\cos 4x$	CO1 – App
2.	Compute the particular Integral $(D^2+1)y=x^2$	CO1 – App
3.	Transform $[(x+2)^2D^2+3(x+2)D+5]y=20$ into linear equation with constant coefficient	CO1 – App
4.	If $\vec{F}=(16x-3y+z)\vec{i}+(x+2ay-2z)\vec{j}+(3x+2y-2z)\vec{k}$ is solenoid find the value of $'a'$.	CO2 – App
5.	Find the unit vector normal to the surface $x^2yz=4$ at (1,1,0)	CO2 – App
6.	If $\vec{F}=2y\vec{i}+z\vec{j}+x\vec{k}$ then find $(i)\ \nabla\circ\vec{F}\quad(ii)\nabla\times\vec{F}$	CO2 – App
7.	Compute $L\left[(2t+1)^2\right]$	CO3 –App
8.	Compute $L^{-1}\left[\log\left(\frac{s+1}{s-2}\right)\right]$	CO3 –App
9	Compute $L\left[\frac{1}{\sqrt{t}}\right]$	CO3 –App
10	Describe Dirichlet's Conditions	CO6 – App
11	Calculate a_n in the Fourier series expansion of $f(x)=3x^2$ in $(0,2\pi)$.	CO4 – App
12	Determine the root mean square value of the function $f(x)=3x$ in $(0,2)$	CO4 – App

13 Determine the Fourier transform of $f(x) = \begin{cases} \sqrt{\pi} & |x| \le 1 \\ 0 & |x| > 1 \end{cases}$ CO5 – App

14 Determine the Fourier sine transform of e^{4x} CO5 – App

15 State and Prove Change of scale property of Fourier Transform. CO5 – App

PART B (5*16 = 80 Marks)

16. (a) Solve the method of variation of parameters, $(D^2+1)y = \sec^2 x$ CO1-App (16)

Or

(b) Solve the differential equation $(x^2D^2 - 3xD - 5)y = x^2 \sin(\log x)$ CO1-App (16)

17 (a) Verify Divergence theorem for $\vec{F} = (x^2 - yz)\vec{i} + (y^2 - xz)\vec{j} + (z^2 - xy)\vec{k}$ CO2-App (16)
over the rectangular parallelepiped $0 \le x \le 2,\ 0 \le y \le 3,\ 0 \le z \le 4$

Or

(b) Determine the Fourier Transform of the function defined by CO5- App (16)
$f(x) = \begin{cases} 9 - x^2 & \text{if } |x| < 3 \\ 0 & \text{if } |x| \ge 3 \end{cases}$ and hence Prove that (i) $\int_0^\infty \frac{\sin t - t\cos t}{t^3} dt = \pi/4$
(ii) $\int_0^\infty \left(\frac{\sin t - t\cos t}{t^3}\right)^2 dt = \pi/15$

18 (a) Solve by using L.T. $y'' - 8y' + 7y = e^{-2t}$ given that if $y(0) = 0,\ y'(0) = 0$ CO3- App (16)

Or

(b) Find the image of $|z - 3i| = 3$ under the transformation $w = \frac{1}{z}$

19 (a) Compute first two harmonics of the Fourier series for the following data. CO4- App (16)

x	0	2	4	6	8	10
y	9	18.2	24.4	27.8	27.5	22.0

(b) Determine the Fourier series for $f(x) = (\pi - x)^2$ in $0 < x < 2\pi$ CO4- App (16)

Or

20 (a) Determine the Fourier Cosine transform of e^{-ax} and hence evaluate CO5- App (16)

$$\int_0^\infty \frac{dx}{(x^2 + 49)(x^2 + 36)}$$

Or

(b) Determine the Fourier sine transform of e^{-ax} and hence evaluate CO5- App (16)

$$\int_0^\infty \frac{dx}{(x^2 + 49)(x^2 + 36)}$$