Reg.No.:								

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 20012

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – JAN. / FEB. 2025

First Semester

Electrical and Electronics Engineering

U15MA101 – CALCULUS

(Regulation 2015)

Time : Three Hours | Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Find $\lim_{x\to a}\frac{x^{5/8}-a^{5/8}}{x^{1/3}-a^{1/3}}$.	2	K1	CO1
2.	Determine whether the function is even or odd $f(x)=e^{x^2}$.	2	K2	CO1
3.	Write Taylor's series expansion for functions of three variables.	2	K1	CO2
4.	Find the critical values of the function $f(x)=2x^3-3x^2-36x$.	2	K2	CO2
5.	Evaluate $\int x\sin x\,dx$.	2	K2	CO3
6.	Evaluate $\int(\log x)^2 dx$.	2	K2	CO3
7.	Evaluate $\int_2^a\int_2^b \frac{dxdy}{xy}$.	2	K2	CO4
8.	Change the order of integration of $\int_0^a\int_y^a f(x,y)\,dydx$.	2	K2	CO4
9.	Find the general solution of $(D^2+1)y=0$.	2	K1	CO5
10.	Find the Particular Integral of $(D^2-9)y=e^{-3x}$.	2	K2	CO5

PART – B

(5 x 16 = 80 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	If $f(x)=\frac{x^2-1}{x^2+x+1}$, then find $f'(x)$ and $f''(x)$.	8	K3	CO1
		ii.	The equation of motion of a particle is $S=t^3-3t$, where S is in meters and t is in seconds. Find a. the velocity and acceleration as functions of t, b. the acceleration at 2 seconds, and c. the acceleration when the velocity is 0.	8	K3	CO1
			(OR)			
	b)		i) Find the maximum and minimum values of $f(x)=3x^4-16x^3-18x^2, -1\le x\le 4$.	16	K3	CO1
12.	a)	i.	If $x=r\cos\theta, y=r\sin\theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$, $\frac{\partial(r,\theta)}{\partial(x,y)}$.	8	K3	CO2
		ii.	If $u=\cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=-\frac{1}{2}\cot u$.	8	K3	CO2
			(OR)			
	b)		If z is a function of x and y and u and v are other two variables, such that $u=lx+my, v=ly-mx$. Show that $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=(l^2+m^2)\left(\frac{\partial^2 z}{\partial u^2}+\frac{\partial^2 z}{\partial v^2}\right)$.	16	K3	CO2
13.	a)	i.	Evaluate $\int \sin 4x\cos 5x dx$.	8	K3	CO3
		ii.	Evaluate $\int_0^{\pi/2}\frac{\sin^n x}{\cos^n x+\sin^n x}dx$.	8	K3	CO3
			(OR)			
	b)	i.	Evaluate $\int\frac{1}{3+2x+x^2}dx$.	8	K3	CO3
		ii.	Evaluate $\int e^x\cos x dx$.	8	K3	CO3

14.	a)	i.	Show that the area between the parabolas $y^2 = 4ax$ *and* $x^2 = 4ay$ is $\frac{16}{3}a^2$ using double integration .	8	K3	CO4
		ii.	Change the order of integration and hence evaluate $\int_0^1 \int_{x^2}^{2-x} xydydx$.	8	K3	CO4
			(OR)			
	b)		Evaluate $I = \int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{1}{\sqrt{1-x^2-y^2-z^2}} dzdydx$.	16	K3	CO4
15.	a)	i.	Solve $(D^2+2D+2)y = e^{-2x} + \cos 2x$.	8	K3	CO5
		ii.	Solve $(D^2+3D+2)y = x\sin x$.	8	K3	CO5
			(OR)			
	b)	i.	Solve $(x^2D^2 - xD + 1)y = \sin(\log x)$.	8	K3	CO5
		ii.	Solve $(D^2+1)y = \sec x$ by method of variation of parameters.	8	K3	CO5