[Total No. of Ques. 05] Seat No: L-16 [Total No. of Pages: 02]

G H Raisoni College of Engineering and Management, Pune.

(An Empowered Autonomous Institute affiliated to Savitribai Phule, Pune University, NAAC Accredited "A+" Grade)

FY B.TECH (All Branch) (TERM 2)

ESE SUMMER 2025 (2023 Pattern)

Integral Calculus & Differential Equation (23UBSL1203)

[Time: 2.30 Hours] **[Max. Marks 60]**

Instructions to the candidates:

1) *All questions compulsory.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*
5) *Other Instructions, if any.*

Q. No.	*Sub Question*		*Marks*	*CO*	*BL*
1	*a)*	Solve $\int_0^{\infty} x^7 e^{-2x^2} dx$	[4]	CO1	L3
	b)	Show that $\int_0^{\pi/2} \sqrt{tan\theta}\, d\theta \int_0^{\pi/2} \sqrt{cot\theta}\, d\theta = \frac{\pi^2}{2}$	[4]	CO1	L3
	c)	Show that $\int_0^1 \frac{x^a - 1}{logx} dx = \log(a+1), a \geq 0.$	[4]	CO1	L3
2	*a)*	Find $\iint y\, dxdy$, over the region bounded by $y = x^2$ and $x + y = 2$ in the first quadrant.	[4]	CO1	L3
	b)	Solve $\int_0^1 \int_0^x (x^2 + 3y) dydx$	[4]	CO1	L3
	c)	Find $\int_2^5 \int_1^4 \int_0^1 e^{x+y+z} dx\, dy\, dz.$	[4]	CO1	L3
3	*a)*	Find the work done by the force $\vec{F}=(x^2 - yz)i + (y^2 - xz)j + (z^2 - xy)k$ in taking particle along the straight line from (1,1,1) to (2,2,0).	[4]	CO2	L3
		OR			
	b)	Evaluate $\oint_c \vec{F} \cdot d\vec{r}$ for $\vec{F} = 3x^2 i + (2xz - y)j + zk$ along the path $x = 2t^2, y = t, z = 4t^2 - 1$ from $t = 0$ to $t = 1$.	[4]	CO2	L3
	c)	Evaluate $\oint_c (siny - y^3)\, dx + (xy^2 + xcosy)dy$ by using Green's Theorem, where c is the circle $x^2 + y^2 = 16$.	[5]	CO2	L3
	d)	Evaluate $\iint_S curl\, \vec{F} \cdot \hat{n}\, ds$ for $\vec{F} = xy^2 i + yj + xz^2 k$ by using Stoke's Theorem, where the surface S is a rectangular lamina bounded by $x = 0, y = 0, x = 1, y = 2, z = 0$.	[5]	CO2	L3

4	a)	Solve $(1+x^2)\frac{dy}{dx} + 2xy = 1$	[5]	CO3	L3
		OR			
	b)	Solve Bernoulli's Equation $xy - \frac{dy}{dx} = y^3 e^{-x^2}$	[5]	CO3	L3
	c)	Solve $(y^2 e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0.$	[5]	CO3	L3
5	a)	Solve the following differential equation by the Method of Variation of Parameters: $\frac{d^2y}{dx^2} + 9y = sec3x.$	[6]	CO4	L3
	b)	Solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2$	[6]	CO4	L3
		OR			
	c)	Solve $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin(\log(1+x)).$	[6]	CO4	L3

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