Code No: P18BST01

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HALL TICKET NUMBER

PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE

(AUTONOMOUS)

I B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, FEB - 2023

MATHEMATICS-I

(Common to All Branches)

Time: 3 hours | Max. Marks: 60

Note: Question Paper consists of Two parts (Part-A and Part-B)

PART-A

Answer all the questions in Part-A (5X2=10M)

Q.No.		Questions	Marks	CO	KL
1.	a)	Find the orthogonal trajectories of the family of curves $x^2 + y^2 = a^2$.	[2M]	1	2
	b)	Write the application of linear differential equation of second and higher order.	[2M]	2	1
	c)	Find the Laplace Transform of $e^{3t} + 9$.	[2M]	3	2
	d)	Evaluate $L^{-1}\left[\frac{1}{s(s-2)}\right]$.	[2M]	4	2
	e)	State Taylor's series expansion of functions of two variables.	[2M]	5	1

PART-B

Answer One Question from each UNIT (5X10=50M)

Q.No.		Questions	Marks	CO	KL
UNIT-I					
2.	a)	Solve the differential equation of $(1-x^2)\frac{dy}{dx} + xy = y^3 sin^{-1}x$.	[5M]	1	3
	b)	Find the orthogonal trajectories of the family of cardioids $r = a(1-\cos\theta)$ where a is the parameter.	[5M]	1	2
OR					
3.	a)	Solve the differential equation $x^2y\,dx - (x^3+y^3)dy = 0$.	[5M]	1	3
	b)	Uranium disintegrates at a rate proportional to the amount present at any instant. If M_1 and $\frac{1}{2}M$ grams of uranium that are present at times T and T_2 respectively. Show that the half-life of uranium is T_2-T_1.	[5M]	1	3
UNIT-II					
4.	a)	Solve the differential equation $(D^2+5D+4)y = 2\sin ax$.	[5M]	2	3
	b)	Solve the differential equation $(D^2+1)y = \cos x$ by the method of variation of parameters.	[5M]	2	3
OR					
5.	a)	Solve the differential equation $(D^2+4)y = e^x \sin^2 x$.	[5M]	2	3
	b)	Solve the differential equation $(D^2+D+1)y = x^3$.	[5M]	2	3
UNIT-III					
6.	a)	Find $L\{f(t)\}$ where $f(t) = \begin{cases} \cos\left(t-\frac{2\pi}{3}\right) & if\ t > \frac{2\pi}{3} \\ 0 & if\ t < \frac{2\pi}{3} \end{cases}$.	[5M]	3	2
	b)	Find the Laplace Transform of $f(t) = e^{3t} Sin^2 t$.	[5M]	3	2
OR					

7.		By using the expansion of sin x show that $L(\sin\sqrt{t}) = \frac{\sqrt{\pi}}{2s^{3/2}} e^{-\frac{1}{4s}}$.	[10M]	3	3
UNIT-IV					
8.	a)	Evaluate $L^{-1}\left[\frac{1+e^{-\pi s}}{s^2+1}\right]$.	[5M]	4	2
	b)	Evaluate $L^{-1}\left[\frac{1}{s(s+1)^3}\right]$.	[5M]	4	2
OR					
9.		Solve the differential equation $(D^2+3D+2)y = e^{-t}, y(0)=0, y'(0)=1$ using Laplace transform	[10M]	4	3
UNIT-V					
10.	a)	Verify Euler's theorem for the function $u = sin^{-1}\frac{x}{y} + tan^{-1}\frac{y}{x}$	[5M]	5	3
	b)	If $u = x^2 - y^2, v = 2xy$ where $x = r\cos\alpha, y = r\sin\alpha$ then show that $\frac{\partial(u,v)}{\partial(r,\alpha)} = 4r^3$.	[5M]	5	2
OR					
11.		Using Taylor's theorem to expand $f(x,y) = x^2 + xy + y^2$ in powers of x-1 and y-2.	[10M]	5	3

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