Seat No.: ________ Enrolment No.___________

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–1/2 EXAMINATION – WINTER 2021

Subject Code:3110015 Date:21/03/2022

Subject Name:Mathematics - 2

Time:10:30 AM TO 01:30 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Find $L\{t^3 e^{-4t}\}$.	**03**
	(b)	Find $L^{-1}\left\{\dfrac{6e^{-2s}}{s^2+4}\right\}$.	**04**
	(c)	Verify Green's theorem for the function $\overline{F}=(x+y)i+2xyj$ and C is the rectangle in the *xy*-plane bounded by $x=0, y=0, x=a, y=b.$	**07**
Q.2	**(a)**	Find $L\{te^{4t}\cos 2t\}$.	**03**
	(b)	Find the Fourier cosine integral of $f(x)=\dfrac{\pi}{2}e^{-x}$, $x\geq 0.$	**04**
	(c)	(i) Find the directional derivative of $f(x,y,z)=2x^2+3y^2+z^2$ at the point (2,1,3) in the direction of $\overline{a}=(1,0,-2).$	**03**
		(ii) If $\overline{F}=(2y+3)i+xzj+(yz-x)k$, evaluate $\int_C \overline{F}.d\overline{r}$ along the path C: $x=2t^2, y=t, z=t^3$ from *t*=0 to *t*=1.	**04**
		OR	
	(c)	Solve in series $3xy''+2y'+y=0$ using Frobeneous method.	**07**
Q.3	**(a)**	Find the arc length of the curve (semi-circular) $x(t)=\cos t, y(t)=\sin t, z(t)=0$; $0\leq t\leq \pi.$	**03**
	(b)	A vector field is given by $\overline{F}=(x^2+xy^2)i+(y^2+x^2y)j.$ Show that $\overline{F}$ is irrotational and find its scalar potential.	**04**
	(c)	Use divergence theorem for $\overline{F}=(x^2-yz)i+(y^2-zx)j+(z^2-xy)k$ over the surface of rectangular parallelepiped, $0\leq x\leq a, 0\leq y\leq b, 0\leq z\leq c$ to evaluate $\iint_S \overline{F}.\hat{n}ds$.	**07**
		OR	
Q.3	**(a)**	Solve $\dfrac{dy}{dx}-y\cot x=2x\sin x.$	**03**
	(b)	Solve $y''+y'-12y=e^{6x}.$	**04**
	(c)	Solve $\dfrac{dy}{dt}-4y=2e^{2t}+e^{4t}$ by Laplace transformation.	**07**

Q.4	**(a)**	Solve $\frac{dy}{dx}+\frac{y}{x}=y^3$.	**03**
	(b)	Solve $(x^2-4xy-2y^2)dx+(y^2-4xy-2x^2)dy=0$.	**04**
	(c)	Solve $y''+9y'=2x^2$ using the method of undetermined coefficients.	**07**

OR

Q.4	**(a)**	Solve $4xp^2=(3x-a)^2$.	**03**
	(b)	Solve $x^2y''+xy'-4y=x^2$.	**04**
	(c)	(i) Express $2-3x+4x^2$ in terms of Legendre's polynomial.	**03**
		(ii) Find ordinary and singular points of $2x^2y''+6xy'+(x+3)y=0$.	**04**
Q.5	**(a)**	Solve $(y-px)(p-1)=p$.	**03**
	(b)	Solve $(D^3+D)y=\cos x$.	**04**
	(c)	Solve $y''+4y=\sec 2x$ by using the method of variation of parameters.	**07**

OR

Q.5	**(a)**	Solve $(D^3-6D^2+11D-6)y=0$.	**03**
	(b)	Solve $(2x+3)^2y''-2(2x+3)y'-12y=6x$.	**04**
	(c)	Find the series solution of $(1+x^2)y''+xy'-9y=0$ near the ordinary point $x=0$.	**07**

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