Enrolment No/Seat No.: _____

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT

(An Autonomous Institute U/s UGC Act 1956)

B.Tech. SEMESTER-III, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1SH301 **DATE: 26-12-2025**

SUBJECT NAME: APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERING

TIME: 11:00 AM to 01:30 PM **TOTAL MARKS: 70**

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.**on the question paper.
2. Write answers of**Section A** and **Section B** in **separate answer books**.
3. Attempt all questions from both **Section A** and **Section B**.
4. Each section carries **35 marks**, with a total of **70 marks** for the examination.
5. The figures to the right of each question indicate full marks, make suitable assumptions with justification.
6. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

			Marks	BL	CO
Q.1	**(a)**	Find Fourier cosine integral of $f(x)=e^{-kx}, x>0, k>0$	**03**	**A**	**6**
	(b)	Express the function $f(x)=\begin{cases}2, & \lvert x\rvert<2\\ 0, & \lvert x\rvert>2\end{cases}$ as f=Fourier cosine integral.	**04**	**A**	**6**
Q.2	**(a)**	Evaluate $L\{\cos^3 2t\}$	**03**	**A**	**4**
	(b)	Find $L^{-1}\left\{\dfrac{4s+5}{(s-1)^2(s+2)}\right\}$	**04**	**A**	**4**
	(c)	Solve the equation $\dfrac{dy}{dt}+2y=10e^{3t}$ given that at *t=0, y*=6 using Laplace transform	**07**	**A**	**4**
		OR			
Q.2	**(a)**	Find $L\{t^2\cosh 2t\}$	**03**	**A**	**4**
	(b)	Find inverse Laplace transform of the following using convolution theorem $L^{-1}\left\{\dfrac{s^2}{(s^2+9)^2}\right\}$	**04**	**A**	**4**
	(c)	Solve $(D^2-1)x=a\cosh t$ given that $x(0)=x'(0)=0$ using Laplace transform	**07**	**A**	**4**

Q.3	**(a)**	Find the root of $x^4 - x - 10 = 0$, correct up to three decimal places using Newton Raphson method	**03**	**A**	**1**
	(b)	Find a real root of the equation $2x - \log_{10} x = 7$ which lies between 3.5 and 4, correct up to five decimal places by regula falsi method	**04**	**A**	**1**
	(c)	Find the root of $\cos x - xe^x = 0$, correct up to three decimal places using secant method	**07**	**A**	**1**

OR

Q.3	**(a)**	Find the positive root of $x = \cos x$ using Newton Raphson method, correct up to three decimal places	**03**	**A**	**1**
	(b)	Find the approximate root of $x^3 - 2x - 1 = 0$, starting from $x_0 = 1.5. x_1 = 2,$ correct up to three decimal places using secant method	**04**	**A**	**1**
	(c)	Find the positive root of $x^3 - 2x - 5 = 0,$ correct up to two decimal places using bisection method.	**07**	**A**	**1**

SECTION B

			Marks	BL	CO
Q.4	**(a)**	Calculate $\int_0^1 2e^x dx$ with *n=10* using trapezoidal rule.	**03**	**A**	**2**
	(b)	Evaluate $\int_0^5 \frac{dx}{4x+5}$ by using Simpson's 1/3 rule, taking 10 equal parts.	**04**	**A**	**2**
Q.5	**(a)**	Find $\frac{dy}{dx} = 1 + y^2$ with initial conditions $x_0=0, y_0=0$ by the Taylor's series method. Find approximate value *y* for *x=0.2.*	**03**	**A**	**3**
	(b)	Using Euler's method, find *y(0.2)* given $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$ with *h=0.1.*	**04**	**A**	**3**
	(c)	Using the fourth order Runge-Kutta method find *y* at *x=0.1* for differential equation $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0$ by taking *h=0.1.*	**07**	**A**	**3**

OR

Q.5	**(a)**	Find the value of *y* for $\frac{dy}{dx} = x + y, y(0) = 1$ when *x=0.1,0.2* with step size *h=0.05* by using Euler's method	**03**	**A**	**3**
	(b)	Use the second-order Runge-Kutta method to find an approximate value of *y* given that $\frac{dy}{dx} = x - y^2$ and *y(0)=1* at *x=0.2* taking *h=0.1.*	**04**	**A**	**3**

	(c)	Determine the value of y when $x=0.1$ correct up to for decimal places by taking $h=0.05$. Given that $\frac{dy}{dx}=x^2+y, y(0)=1$ by Euler's modified method	**07**	**A**	**3**
Q.6	**(a)**	Find Fourier sine series of the function $f(x)=\pi-x;\ 0\le x\le\pi$	**03**	**A**	**5**
	(b)	Find Fourier series of the function $f(x)=x^2;\ -\pi\le x\le\pi$	**04**	**A**	**5**
	(c)	Find Fourier series of the function $f(x)=e^{ax};\ 0\le x\le 2\pi$	**07**	**A**	**5**

OR

Q.6	**(a)**	Find Fourier series of the function $f(x)=2x;\ -1\le x\le 1$	**03**	**A**	**5**
	(b)	Find Fourier cosine series of the function $f(x)=x;\ 0\le x\le\pi$	**04**	**A**	**5**
	(c)	Find Fourier series of the function $f(x)=\frac{1}{2}(\pi-x);\ 0\le x\le 2\pi$. Hence deduce that $\frac{\pi}{4}=1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+.....$	**07**	**A**	**5**

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