Enrolment No/Seat No.: ____________________

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

(An Autonomous College U/s UGC Act 1956)

B.Tech. SEMESTER-II, SEMESTER END EXAMINATION – SUMMER 2025

Subject Code: 1SH203 **Date: 17-05-2025**

Subject Name: MATHEMATICS -2

Time: 11:00 AM to 02:00 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 - Bloom's Taxonomy Levels (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

SECTION A

		Marks	BL	CO
Q.1	**Multiple-Choice Questions**	**[05]**		
	(a) Which of the function is odd function_______________.	**1**	**R**	**2**
	(i) sinx **(ii)** cosx			
	(iii) e^x **(iv)** xsinx			
	(b) $f(x) = x\cos x$ in $(-\pi, \pi)$ then b_1 is ________________.	**1**	**U**	**2**
	(i) 0 **(ii)** π			
	(iii) 1 **(iv)** None of these			
	(c) If $f(x)$ is odd function in $(-l, l)$ then value of a_n ________________.	**1**	**R**	**2**
	(i) 0 **(ii)** $\frac{\pi}{2}$			
	(iii) 1 **(iv)** $l-1$			
	(d) The series $\sum \frac{1}{n^p}$ is divergent if _______________.	**1**	**U**	**1**
	(i) $p > 1$ **(ii)** $p < 1$			
	(iii) $p \le 1$ **(iv)** $p \ge 1$			

(e) The infinite series $1+\frac{1}{2}+\frac{1}{2^2}+\frac{1}{2^3}+\ldots\ldots$______________.		**1**	**R**	**1**
(i) Divergent **(ii)** Convergent **(iii)** Oscillatory **(iv)** None of these				
Q.2 **Attempt Any Two**		**[10]**		
(a) Find the Absolute or conditional convergence of series $\sum_{n=1}^{\infty}\frac{(-1)^n n^2}{n^3+1}$.		**5**	**A**	**1**
(b) Test the convergence of the following series $\frac{x}{1.2}+\frac{x^2}{3.4}+\frac{x^3}{5.6}+\ldots$		**5**	**A**	**1**
(c) Test the convergence of the series $\frac{1\cdot 2}{3^2\cdot 4^2}+\frac{3\cdot 4}{5^2\cdot 6^2}+\frac{5\cdot 6}{7^2\cdot 8^2}+\cdots\cdots$		**5**	**A**	**1**
Q.3 **Attempt Any Two**		**[10]**		
(a) Find Fourier series of $f(x)=\frac{1}{2}(\pi-x)$ on interval $(0,2\pi)$.		**5**	**A**	**2**
(b) Find Fourier series of $f(x)=4-x^2$ on interval $(0,2)$, Hence deduce that $\frac{\pi^2}{3}=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots$		**5**	**A**	**2**
(c) Find sine series of $f(x)=2x$ on interval $0<x<1$		**5**	**A**	**2**
Q.4 **Attempt Any Two**		**[10]**		
(a) Express $f(x)=e^{-kx}$ $(k>0)$ as Fourier cosine integral.		**5**	**A**	**3**
(b) Find Fourier integral representation of the function $f(x)=\begin{cases}1, & \lvert x\rvert<1 \\ 0, & \lvert x\rvert>1\end{cases}$.		**5**	**A**	**3**
(c) Test the convergence of the series $\sum\frac{(-1)^n(n+1)^n}{(2^n)^n}$.		**5**	**A**	**1**

SECTION B

		Marks	BL	CO
Q.5	**Multiple-Choice Questions**	**[05]**		
	(a) If $L\left\{\frac{\sin t}{t}\right\}=\tan^{-1}\left(\frac{1}{s}\right)$, then $L\left\{\frac{\sin at}{t}\right\}$ is______. **(i)** $\tan^{-1}(s)$ **(ii)** $\tan^{-1}\left(\frac{s}{a}\right)$ **(iii)** $\tan^{-1}\left(\frac{a}{s}\right)$ **(iv)** $\tan^{-1}\left(\frac{1}{s}\right)$	**1**	**A**	**4**
	(b) $L^{-1}\left\{\frac{1}{(s+a)^2}\right\}=$ ____ **(i)** e^{-at} **(ii)** te^{-at} **(iii)** t^2e^{-at} **(iv)** te^{at}	**1**	**A**	**4**
	(c) $L\left\{e^{3t+3}\right\}=$ ____ **(i)** $\frac{e^3}{s+3}$ **(ii)** $\frac{e^3}{s-3}$ **(iii)** $\frac{e^3}{s}$ **(iv)** $\frac{e^3}{s^2-3}$	**1**	**A**	**4**
	(d) The partial differential equation formed by eliminating arbitrary constants from the equation $z=ax^2+by^2$ is **(i)** $2z=xp+yq$ **(ii)** $z=xq+yp$ **(iii)** $z=xp+yq$ **(iv)** none of these	**1**	**A**	**5**
	(e) The solution of the equation $z=px+qy-pq$ is _______ **(i)** $z=ax+by+ab$ **(ii)** $z=ax+by-ab$ **(iii)** $z=ax-by-pq$ **(iv)** none of these	**1**	**A**	**5**
Q.6	**Attempt Any Two**	**[10]**		
	(a) Find the Laplace transform of (i) $\sin^2 3t$ (ii) $e^{-3t}(2\cos 5t-3\sin 5t)$	**5**	**A**	**4**
	(b) Find Laplace transform of $te^{4t}\cos 2t$	**5**	**A**	**4**
	(c) Find the inverse Laplace transform of $\frac{s+7}{s^2+8s+25}$.	**5**	**A**	**4**

Q.7	**Attempt any Two**		**[10]**		
	(a)	Solve the initial value problem $y''+4y'+3y=e^{-t}, y(0)=y'(0)=1$ using Laplace transform.	5	A	4
	(b)	Using convolution theorem find inverse Laplace transform $\dfrac{1}{(s+2)(s-1)}$	5	A	4
	(c)	Derive a partial differential equation by eliminating the arbitrary constants $a \text{ and } b$ from $z=(x-2)^2+(y-3)^2$	5	A	5
Q.8	**Attempt any Two**		**[10]**		
	(a)	Eliminate the arbitrary function from the equation $z=xy+f\left(x^2+y^2\right)$	5	A	5
	(b)	Solve $x^2p+y^2q=z^2$	5	A	5
	(c)	Solve (i) $\sqrt{p}+\sqrt{q}=1$ (ii) $p-x^2=q+y^2$	5	A	5

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