

R.N.G.PATEL INSTITUTE OF TECHNOLOGY-RNGPIT
(An Autonomous College U/s UGC Act 1956)

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

SUBJECT CODE: 1SH203

DATE: 06-01-2026

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 even function_____.	1	R	2
(i) $\sin x$			
(ii) $\cos x$			
(iii) e^x			
(iv) $x \sin x$			
(b) $f(x) = x \sin x$ 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 even function in $(-l, l)$ then the value of b_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) $p \leq 1$			
(iv) $p \geq 1$			

- (e) The infinite series $1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \dots$ _____ **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 $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} n}{n^2 + 1}$. **5** **1**
- (b) Test the convergence of the following series $\frac{x^{n-1}}{(3n-2)(3n-1)(3n)}$. **5** **1**
- (c) Test the convergence of the series $\frac{1 \cdot 2}{3^2 \cdot 4^2} + \frac{3 \cdot 4}{5^2 \cdot 6^2} + \frac{5 \cdot 6}{7^2 \cdot 8^2} + \dots$ **5** **1**

Q.3 Attempt Any Two **[10]**

- (a) Find Fourier series of $f(x) = x$ on interval $(0, 2\pi)$. **5** **2**
- (b) Find Fourier series of $f(x) = x^2$ on interval $(0, 4)$. **5** **2**
- (c) Find sine series of $f(x) = 2x$ on interval $0 < x < 1$. **5** **2**

Q.4 Attempt Any Two **[10]**

- (a) Express $f(x) = e^{-kx}$ ($k > 0$) as Fourier sine integral. **5** **3**
- (b) Find Fourier integral representation of the function $f(x) = 2, |x| < 2$
 $0, |x| > 2$. **5** **3**
- (c) Using Fourier integral of $f(x) = \sin x, 0 \leq x \leq \pi$
 $0, x > \pi$. **5** **3**

SECTION B

Marks BL CO

Q.5 Multiple-Choice Questions

[05]

- (a) If $L\{f(t)\} = \bar{f}(s)$, then $L\{e^{-at}f(t)\}$ is_____.
- | | |
|---|---|
| <p>(i) $\bar{f}(s-a)$</p> <p>(iii) $\bar{f}(s+a)$</p> | <p>(ii) $\frac{\bar{f}(s-a)}{a}$</p> <p>(iv) $\frac{\bar{f}(s+a)}{a}$</p> |
|---|---|
- (b) $L\{f'(t)\} =$ _____.
- | | |
|--|--|
| <p>(i) $s\bar{f}(s) - f(0)$</p> <p>(iii) $\bar{f}(s) - f(0)$</p> | <p>(ii) $s\bar{f}(s) + f(0)$</p> <p>(iv) $\bar{f}(s) + f(0)$</p> |
|--|--|
- (c) $L^{-1}\left\{\frac{1}{(s+a)^2}\right\} =$ _____
- | | |
|--|--|
| <p>(i) e^{-at}</p> <p>(iii) t^2e^{-at}</p> | <p>(ii) te^{-at}</p> <p>(iv) te^{at}</p> |
|--|--|
- (d) The solution of the equation $z = px + qy - pq$ is _____.
- | | |
|---|---|
| <p>(i) $z = ax + by + ab$</p> <p>(iii) $z = ax + by - ab$</p> | <p>(ii) $z = ax - by - pq$</p> <p>(iv) none of these</p> |
|---|---|
- (e) The partial differential equation formed by eliminating arbitrary functions from the equation $z = f\left(\frac{x}{y}\right)$ is _____
- | | |
|---|---|
| <p>(i) $xp + yq = 0$</p> <p>(iii) $\frac{x}{y} = p$</p> | <p>(ii) $xq + yp = 0$</p> <p>(iv) $\frac{x}{y} = q$</p> |
|---|---|

Q.6 Attempt Any Two

[10]

- (a) Find the Laplace transform of
- | | |
|-----------------------------------|--|
| <p>(i) $\sin^2 3t$</p> | <p>(ii) $e^{2t} \sin^2 t$</p> |
|-----------------------------------|--|
- (b) Find $L\left\{\int_0^t e^t \cdot \frac{\sin t}{t} dt\right\}$
- (c) Use Laplace transform method to solve $y'' + 6y' = 1$. $y(0) = 2$, $y'(0) = 0$.

Q.7 Attempt Any Two	[10]		
(a) Find inverse Laplace transform of $\frac{s+2}{s(s+1)(s+3)}$.	5	A	4
(b) Using convolution theorem find inverse Laplace transform $\frac{1}{s^2(s+5)}$.	5	A	4
(c) Use Laplace transform method to solve $y'' + 2y = e^{-3t}$, $y(0) = 1$.	5	A	4
Q.8 Attempt Any Two	[10]		
(a) Derive a partial differential equation by eliminating the arbitrary constants a and b from $z = (x-2)^2 + (y-3)^2$.	5	A	5
(b) Form a partial differential equation by eliminating the arbitrary functions from $F(x^2 - y^2, xyz) = 0$.	5	A	5
(c) Solve $yzp - xzq = xy$.	5	A	5
