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: 1SH204 **Date: 17-05-2025**

Subject Name: APPLIED MATHEMATICS

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)	In a symmetric distribution, mean, median and mode are connected by	**1**	**R**	**5**
	(i) Mode = 2 Median – 3 Mean **(ii)** Mean = 3 Median – 2 Mode			
	(iii) Mode = 3 Median – 2 Mean **(iv)** Median = 3 Mode – 2 Mean			
(b)	Find the value of x, if the mode of the following data is 25: 15, 20, 25, 18, 14, 15, 25, 15, 18, 16, 20, 25, 20, x	**1**	**U**	**5**
	(i) 15 **(ii)** 18			
	(iii) 25 **(iv)** 20			
(c)	If $f(x)$ is a probability density function of a continuous random variable, then $\int_{-\infty}^{\infty} f(x)\,dx =$	**1**	**U**	**4**
	(i) 0 **(ii)** 1			
	(iii) undefined **(iv)** infinite			
(d)	A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?	**1**	**A**	**4**
	(i) 10/21 **(ii)** 10/20			
	(iii) 2/7 **(iv)** 5/7			

(e) A and B are two events such that $P(\bar{A}) = 0.4$ and $P(A \cap B) = 0.2$ Then $P(A \cap \bar{B})$ is equal to _____ **1** **A** **4**

(i) 0.4 **(ii)** 0.2

(iii) 0.6 **(iv)** 0.8

Q.2 Attempt Any Two **[10]**

(a) If A and B are two events such that $P(A) = \frac{3}{8}$, $P(B) = \frac{5}{8}$ and $P(A \cup B) = \frac{3}{4}$, find $P(A/B)$ and $P(B/A)$. Check whether A and B are independent. **5** **A** **4**

(b) In a bolt factory, machines A, B and C manufacture 25%, 35% 40% of the total output and out of the total manufacturing, 5%, 4% and 2% bolts are defective. A bolt is drawn at random form the product and it is found to be defective. Find the probability that it is manufactured by machine A. **5** **A** **4**

(c) A discrete random variable has the probability mass function given below: **5** **A** **4**

X	-2	-1	0	1	2	3
$P(X = x)$	0.2	k	0.1	2k	0.1	2k

Find k, mean and variance.

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

(a) Considering x as a dependent variable, fit a straight line to the following data. **5** **A** **3**

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

(b) Fit a second-degree parabola $y = a + bx^2$ to the following data: **5** **A** **3**

x	1	2	3	4	5
y	1.8	5.1	8.9	14.1	19.8

(c) Fit a curve of the form $y = ax^b$ to the following data: **5** **A** **3**

x	20	16	10	11	14
y	22	41	120	89	56

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

(a) Calculate the first four moments from the following data: **5** **A** **5**

x	0	1	2	3	4	5	6	7	8
f	5	10	15	20	25	20	15	10	5

Also, calculate the values of β_1 and β_2.

(b) Calculate the standard deviation of the following data: **5** **A** **5**

x	10	11	12	13	14	15	16	17	18
f	2	7	10	12	15	11	10	6	3

(c) The runs scored by two batsmen A and B in 9 consecutive innings are given below. **5** **A** **5**

A	85	20	62	28	74	5	69	4	13
B	72	4	15	30	59	15	49	27	26

Which batsman is more consistent?

SECTION B

Marks **BL** **CO**

Q.5 Multiple-Choice Questions **[05]**

(a) Interpolation is a method of _____. **1** **R** **2**

(i) Interrelating **(ii)** Estimating

(iii) Integrating **(iv)** combining

(b) Which relation between the operators is correct? **1** **R** **2**

(i) $\Delta = E - 1$ **(ii)** $\Delta = E + 1$

(iii) $\nabla = E - 1$ **(iv)** $\nabla = E + 1$

(c) Which method can be used for both equal and unequal intervals? **1** **R** **2**

(i) Lagrange's method **(ii)** Divided difference method

(iii) Newton's method **(iv)** Both (i) and (ii)

(d) The complete solution of $z = px + qy + \log(pq)$ is _____. **1** **A** **1**

(i) $z = ax + by$ **(ii)** $z = ax + by + ab$

(iii) $z = ax + by + \log(ab)$ **(iv)** None of these

(e) What is the nature of Lagrange's linear partial differential equation? **1** **R** **1**

(i) First order, Third degree **(ii)** Second order, First degree

(iii) First order, Second degree **(iv)** First order, First degree

Q.6 Attempt Any Two **[10]**

(a) Using Newton's forward interpolation formula, find the value of $f(1.6)$ from the following data: **5** **A** **2**

x	1	1.4	1.8	2.2
f(x)	3.49	4.82	5.96	6.5

(b) Consider the following tabular values **5 A 2**

x	50	100	150	200	250
y	618	724	805	906	1032

Determine $y(300)$ using Newton's backward interpolation formula.

(c) Using Newton's divided difference formula, compute $f(10.5)$ from the following data: **5 A 2**

x	10	11	13	17
$f(x)$	2.3026	2.3979	2.5649	2.8332

Q.7 Attempt Any Two **[10]**

(a) Evaluate $f(9)$ by using Lagrange's interpolation method from the following data: **5 A 2**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

(b) Form a partial differential equation of $z = f\left(\frac{x}{y}\right)$. **5 A 1**

(**c**) Form the partial differential equation by eliminating the arbitrary function from $xyz = \phi(x+y+z)$. **5 A 1**

Q.8 Attempt Any Two **[10]**

(a) Solve: $(y+z)p+(z+x)q = x+y$ **5 A 1**

(b) Solve: (i) $\sqrt{p}+\sqrt{q}=1$ (ii) $p-x^2 = q+y^2$ **5 A 1**

(c) Solve: (i) $z = px+qy+p^2q^2$ (ii) $z = px+qy-2\sqrt{pq}$ **5 A 1**

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