

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

B.Voc. SEMESTER-I, SEMESTER END EXAMINATION – WINTER 2025

SUBJECT CODE: 1SH116

DATE: 15-12-2025

SUBJECT NAME: MATHEMATICS

TIME: 11:00 AM to 01:00 PM

TOTAL MARKS: 50

Instructions

1. It is **compulsory** for students to write **Enrolment No. /Seat No.** on the question paper.
2. Attempt all questions in the question paper.
3. The figures to the right of each question indicate full marks. Make suitable assumptions with proper justification wherever required.
4. Simple, non-programmable scientific calculators are permitted.
5. BL - Cognitive Level (As per Revised Bloom's Taxonomy) (R-Remember, U-Understanding, A –Application, N –Analyze, E – Evaluate, C -Create), CO - Course Outcomes.

- | | | Marks | BL | CO | | | | | | | | | | | | | | | | | | | | |
|------------|---|-----------|----------|----------|-------|-------|-------|-------|-----------|---|---|-----|----|----|----|-----------|----------|----------|----|----|---|-----------|----------|----------|
| Q.1 | <p>(a) Calculate the mean for the following frequency distribution:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">Class</td> <td style="padding: 2px;">0-8</td> <td style="padding: 2px;">8-16</td> <td style="padding: 2px;">16-24</td> <td style="padding: 2px;">24-32</td> <td style="padding: 2px;">32-40</td> <td style="padding: 2px;">40-48</td> </tr> <tr> <td style="padding: 2px;">Frequency</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">16</td> <td style="padding: 2px;">24</td> <td style="padding: 2px;">15</td> <td style="padding: 2px;">7</td> </tr> </table> | Class | 0-8 | 8-16 | 16-24 | 24-32 | 32-40 | 40-48 | Frequency | 8 | 7 | 16 | 24 | 15 | 7 | 05 | A | 1 | | | | | | |
| Class | 0-8 | 8-16 | 16-24 | 24-32 | 32-40 | 40-48 | | | | | | | | | | | | | | | | | | |
| Frequency | 8 | 7 | 16 | 24 | 15 | 7 | | | | | | | | | | | | | | | | | | |
| | <p>(b) Calculate the first four moments from the following data:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">x</td> <td style="padding: 2px;">0</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">4</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">8</td> </tr> <tr> <td style="padding: 2px;">y</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">15</td> <td style="padding: 2px;">20</td> <td style="padding: 2px;">25</td> <td style="padding: 2px;">20</td> <td style="padding: 2px;">15</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">5</td> </tr> </table> | x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | y | 5 | 10 | 15 | 20 | 25 | 20 | 15 | 10 | 5 | 05 | A | 1 |
| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | | | | | | | | | | | | |
| y | 5 | 10 | 15 | 20 | 25 | 20 | 15 | 10 | 5 | | | | | | | | | | | | | | | |
| Q.2 | <p>(a) If $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & -1 & 1 \\ 2 & 1 & 1 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 1 & 0 \\ 2 & 1 & 1 \\ 1 & 4 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ then evaluate the following:</p> <p style="margin-left: 20px;">i) $2A + B$</p> <p style="margin-left: 20px;">ii) $3A + 2B + C$</p> | 05 | A | 2 | | | | | | | | | | | | | | | | | | | | |
| | <p>(b) Reduce the matrix $\begin{bmatrix} 1 & -1 & 2 \\ 3 & 1 & 1 \\ 0 & 1 & 2 \end{bmatrix}$ into upper triangular matrix.</p> | 05 | A | 2 | | | | | | | | | | | | | | | | | | | | |
| OR | | | | | | | | | | | | | | | | | | | | | | | | |
| Q.2 | <p>(a) Find the value of the determinant $\begin{vmatrix} 2 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{vmatrix}$.</p> | 05 | A | 2 | | | | | | | | | | | | | | | | | | | | |
| | <p>(b) Find the inverse of the matrix $\begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{bmatrix}$.</p> | 05 | A | 2 | | | | | | | | | | | | | | | | | | | | |
| Q.3 | <p>(a) If $\vec{u} = 7\hat{i} + 4\hat{j}$, $\vec{v} = 2\hat{i} - 3\hat{j}$ and $\vec{w} = 3\hat{i} - \hat{j}$, find $\vec{u} + 2\vec{v} - \vec{w}$.</p> | 05 | A | 3 | | | | | | | | | | | | | | | | | | | | |

(b) If $\vec{u} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{v} = 2\hat{i} - \hat{j} + \hat{k}$, find $|\vec{u} + \vec{v}|$ and $|\vec{u} - \vec{v}|$. 05 A 3

OR

Q.3 (a) If $\vec{u} = 2\hat{i} + 3\hat{j} + \hat{k}$ and $\vec{v} = 2\hat{i} - 3\hat{j} + 2\hat{k}$, find $\vec{u} + \vec{v}$ and $\vec{u} - \vec{v}$. 05 A 3

(b) If $\vec{u} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{v} = \hat{i} - \hat{j} + 3$, find $|\vec{u}|$ and $\vec{u} \cdot \vec{v}$. 05 A 3

Q.4 (a) Find the derivative of the following: 05 A 4

i) $f(x) = x^2 - 4x + 11$

ii) $f(x) = e^x \log x$

(b) Find the integration of the following: 05 A 4

i) $f(x) = \frac{1}{x} + e^{2x} + \cos x$

ii) $f(x) = e^x \sin x$

OR

Q.4 (a) Find the derivative of the following: 05 A 4

i) $f(x) = x^4 - 2x^2 + 4x + 11$

ii) $f(x) = \frac{\sin x}{x}$

(b) Find the integration of the following: 05 A 4

i) $f(x) = x^2 - 4x + 11$

ii) $f(x) = e^x - \sin x$

Q.5 (a) Find order and degree of the following differential equations: 05 A 5

i. $\frac{dy}{dx} + xy = x^2$ ii. $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^3 + y = \cos x$

iii. $\sqrt{\frac{dy}{dx}} - y = 0$

(b) Solve $\frac{dy}{dx} = \frac{y}{x}$ by using the method of separable of variable. 05 A 5

OR

Q.5 (a) Form a differential equation corresponding to the following equations: 05 A 5

i. $y = ae^x$

ii. $y = c_1e^x + c_2e^{-x}$

(b) Solve $\frac{dy}{dx} + y = x$. 05 A 5
