Seat No.

# OCT-NOV 2025 WINTER EXAMINATION

## 11731 Bachelor of Technology (NEP-2.0)

## Sub. Name: Engineering Mathematics-I

## Sub. Code: 108717

**Day and Date: Friday ,06-02-2026** **Total Marks: 60**

**Time: 10:30 AM To 01:00 PM**

**Instructions:**

**Special Inst.:** **1) All questions are compulsory.**
**2) Figures to the right indicate full marks.**
**3) Use of non-programmable calculator is allowed.**

**Q1)** Attempt any Three of the following. (5 Marks Each) **[15]**

**a.** Prove that $(1+i)^{100}+(1-i)^{100}=-2^{51}$. **[5]**

**b.** Arrange in power of $x$, by using Taylor's Theorem, **[5]**
$7+(x+2)+3(x+2)^3+(x+2)^4$

**c.** If $z=f(x+at)+\emptyset(x-at)$ then prove that $\frac{\partial^2 z}{\partial t^2}=a^2\frac{\partial^2 z}{\partial x^2}$ **[5]**

**d.** Solve the equation $7coshx+8\,sinhx=1$ for real values of $x$. **[5]**

**Q2)** Attempt any Three of the following. (5 Marks Each) **[15]**

**a.** Reduce the following matrix to its normal form and hence find rank. **[5]**

$$\begin{bmatrix} 3 & 4 & -2 & 1 \\ 5 & 8 & 4 & 2 \\ 8 & 12 & 2 & 3 \\ 13 & 20 & 6 & 5 \end{bmatrix}$$

**b.** **[5]**
Test for consistency the following equations, and if possible, solve the equations.
$x+y+z=6,\quad x-y+2z=5,\qquad 3x+y+z=8,\quad 2x-2y+3z=7$

**c.** **[5]**
Solve the following equations
$7x+y-2z=0,\quad x+5y-4z=0,\quad 3x-2y+z=0\,,\quad 2x-7y+5z=0$

**d.**

Determine the value of **λ**, such that the system of equations [5]
$2x + 3y - 2z = 0$ , $3x - y + 3z = 0$ , $7x + \lambda y - z = 0$ has a non-trivial solution. Hence, find the solution.

**Q3)** Attempt any Three of the following. (5 Marks Each) **[15]**

**a.** [5]

Find the characteristic equation of the matrix A and hence find $A^{-1}$ where

$$A=\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$$

**b.** [5]

Find the eigen values of matrix $A=\begin{bmatrix} 9 & -1 & 9 \\ 3 & -1 & 3 \\ -7 & 1 & -7 \end{bmatrix}$ and hence find eigen vector for largest eigen value.

**c.** [5]

Find the eigen values of matrix $A=\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$

and hence find eigen values of $(i)A^{-1}$ (ii) $adj\ A$

**d.** [5]

Verify Cayley-Hamilton Theorem for the matrix

$$A=\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$

**Q4)** Attempt any Three of the following. (5 Marks Each) **[15]**

**a.** [5]

Apply Gauss Elimination method to solve the equations

$2x + 4y + z = 3$ , $3x + 2y - 2z = -2$, $x + y + z = 4$

**b.** [5]

Solve by Gauss-Seidel method (Three iterations only)

$2x + 17y + 4z = 35$ , $x + 3y + 10z = 24$ , $28x + 4y - z = 32$

**c.** [5]

Apply Gauss Jordan method to solve the equations

$6x - y - z = 19$, $3x + 4y + z = 26$, $x + 2y + 6z = 22$

**d.** **[5]**

Solve by Jacobi's iteration method (Three iterations only)

$5x + 2y + z = 12$ , $x + 4y + 2z = 15$ , $x + 2y + 5z = 20$

# End Of Question Paper

**Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -**
This Question Paper may be distributed for following Subjects as common code.
सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

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