



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2024 Admission
IV Semester Final Examination – July 2026

BES 2221

Engineering Mathematics - II (2+0)

Marks: 50
Time: 2 hours

I Answer the following

(10x1=10)

1. Form the partial Differential equation from the equation $z = ax + by + ab$ by eliminating the arbitrary constants
2. Write Laplace's equation
3. Write the fundamental period of $\sin 3x$
4. Classify the following Partial Differential Equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y}$
5. Find the rank of the matrix $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

State True or False

6. The Laplace equation represents steady-state heat flow.
7. The real and imaginary parts of an analytic function are harmonic.
8. The Fourier series of an even function contains only sine terms.
9. The determinant of a matrix equals the product of its eigenvalues.

Choose the correct answer

10. If u and v satisfy the C-R equations, then v is called the
 - A) inverse of u
 - B) derivative of u
 - C) harmonic conjugate of u
 - D) modulus of u

II Write short notes on ANY FIVE of the following

(5x2=10)

1. Form the PDE from $z = f(2x + y) + g(3x - y)$
2. Solve the equation $yzp + xzq = xy$
3. Find the value of $\lim_{z \rightarrow 1} \frac{z^2 - 1}{z - 1}$
4. Find the sum of the series $0.1 + 0.01 + 0.001 + 0.0001 + \dots$
5. Find the Fourier coefficient a_n for the function $f(x) = x$ in $(-\pi, \pi)$
6. Using Cayley Hamilton theorem, find A^2 where $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$
7. Find the matrix associated with the quadratic form $2x_1^2 + x_2^2 + x_3^2 + 2x_1x_2 - 2x_1x_3 - 4x_2x_3$

III Answer ANY FIVE of the following

(5x4=20)

1. If $f(z) = u(x, y) + i v(x, y)$ is analytic in a domain D , Then prove that both u and v satisfy Laplace's equation.
2. Find the values of a and b for which the system of linear equations
$$x + 2y + 3z = 6, \quad x + 3y + 5z = 9, \quad 2x + 5y + az = b$$
has
 - a) No solution
 - b) Unique solution
 - c) Infinitely many solutions

3. Solve the following equations by the Gauss-Jordan method:

$$5x + 2y + z = 29, x + 4y + 2z = 4, 2x - y + 10z = 44$$

4. Determine a, b, c, d so that function $f(z) = (x^2 + axy + by^2) + i(cx^2 + dxy + y^2)$ is analytic.

5. Discuss the convergence of the series $\frac{3}{5^2} + \frac{4}{5^2} + \frac{3}{5^3} + \frac{4}{5^3} + \dots$ to ∞

6. Using Charpit's method, solve the equation $(p^2 + q^2)y = qz$

7. Solve $\frac{\partial^3 z}{\partial x^3} - 3 \frac{\partial^3 z}{\partial x^2 \partial y} + 4 \frac{\partial^3 z}{\partial y^3} = e^{x+2y}$

IV

Write an essay on ANY ONE of the following

(1x10=10)

1. Find the Fourier series of $f(x) = |x|$ in $[-\pi, \pi]$.

2. Find the eigenvalues and eigen vectors of the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$
