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KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2023 & Previous Admissions
II Semester Final Re - Examination – July 2026

Sacs.1206

Engineering Mathematics II (2+1)

Marks: 50
Time: 2 hours

I Choose the correct answer

(10x1=10)

1. Series $1 + r + r^2 + \dots \infty$ is
 - (a) Converges if $p \leq 1$
 - (b) diverges if $p \leq 1$
 - (c) Oscillatory if $p \leq 1$
 - (d) none of these
2. Pick out one of the conditions of Dirichlet's condition.
 - (a) $f(x)$ is periodic, single valued and finite
 - (b) $f(x)$ has infinite number of infinite discontinuous in any one period.
 - (c) $f(x)$ is infinite valued function
 - (d) $f(x)$ has infinite number of maxima and minima.
3. The Fourier series expansion of x^2 in the interval $-1 \leq x \leq 1$ with periodic condition has
 - (a) $a_0 \neq 0, a_n = 0, b_n \neq 0$
 - (b) $a_0 \neq 0, a_n \neq 0, b_n = 0$
 - (c) $a_0 = 0, a_n = 0, b_n \neq 0$
 - (d) $a_0 = 0, a_n \neq 0, b_n = 0$.
4. How many simple poles does the function $f(z) = \frac{7+9z}{(z-5)^3(z+7)(z-8)}$ has
 - (a) 5
 - (b) 3
 - (c) 2
 - (d) None of these
5. The series $\sum_{n=0}^{\infty} \frac{1}{3^n}$
 - (a) Converges
 - (b) Diverges
 - (c) Geometric and diverges
 - (d) None of these
6. The Fourier Cosine transform of $f(x) = \begin{cases} 1, & \text{if } |x| < a \\ 0, & \text{if } |x| \geq a \end{cases}$ is
 - (a) $\sqrt{\frac{2}{\pi}} \frac{\cos as}{s}$
 - (b) $\sqrt{\frac{2}{\pi}} \frac{\sin as}{s}$
 - (c) $a \sqrt{\frac{2}{\pi}} \frac{\cos s}{s}$
 - (d) $a \sqrt{\frac{2}{\pi}} \frac{\sin s}{s}$

7. The Partial differential equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, $c \neq 0$ is known as.....

- (a) One dimensional heat equation
- (b) One dimensional wave equation
- (c) Laplace equation
- (d) None of these

8. The partial differential equation formed from the expression $z = ax + by + \sqrt{a^2 + b^2}$ by eliminating arbitrary constants a and b is.....

- (a) $z = px + qy + \sqrt{p^2 + q^2}$
- (b) $z = qx + py + \sqrt{p^2 + q^2}$
- (c) $z = p(x + y) + \sqrt{p^2 + q^2}$
- (d) $z = q(x + y) + \sqrt{p^2 + q^2}$

9. If a function $f(z) = u + iv$ is analytic, then it satisfy the following relation

- (a) $u_x = -v_y, u_y = v_x$
- (b) $u_x = -v_x, u_y = v_y$
- (c) $u_x = v_y, u_y = -v_x$
- (d) $u_x = v_x, u_y = -v_y$

State True or False

10. "While solving a partial differential equation using a variable separable method, we assume that the function can be written as the product of two functions which depend on one variable only".

II Write short notes on ANY FIVE of the following

(5x2=10)

1. Examine the convergence of $\sum_{k=1}^{\infty} \frac{1}{k!}$
2. Find the Fourier sine transform of $f(x) = e^{-x}$.
3. If $f(x)$ is a periodic function with period 2π defined in $[-\pi, \pi]$. Write the Euler's formulas a_0, a_n, b_n for $f(x)$.
4. Form the partial differential equation of all spheres whose centers lie on z-axis.
5. Write down the possible solutions of one dimensional heat equation,
6. Determine 'a' so that $u = e^{-\pi x} \cos ay$ is harmonic..
7. Find the Taylor series of $f(z) = \cos z$ about $z = \pi$

III Answer ANY FIVE of the following

(5x4=20)

1. Determine whether the series $\sum_{k=1}^{\infty} (-\frac{3}{5})^k$ converges and if so find its sum.
2. Test the convergence of $\sum_{k=1}^{\infty} \frac{3k^3 - 2k^2 + 4}{k^7 - k^3 + 2}$.
3. Form the partial differential equation by eliminating the arbitrary functions from $z = f(x + y) + g(x - y)$.
4. Check whether the function $f(z) = iz\bar{z}$ analytic or not. Justify your answer.
5. Find the half range sine series expansion of $f(x) = \pi x - x^2$ in $(0, \pi)$
6. Find the residue of $f(z) = \frac{8}{1+z^2}$ at its poles.
7. Using the method of separation of variables, solve $3 \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0$.

IV Write an essay on ANY ONE of the following

(1x10=10)

1. Verify Cauchy's theorem for the integral of z^2 over the boundary of the square with vertices $1 + i, 1 - i, -1 + i, -1 - i$.
2. Determine whether the alternating series $\sum_{k=1}^{\infty} (-1)^{k+1} \frac{k+7}{k(k+4)}$ is conditionally convergent or not.
