KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.)
II Semester Final Re - Examination – August 2025
2023 & Previous Admissions

Sacs.1206 **Engineering Mathematics – II (2+1)** **Marks: 50**
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. The value of $\frac{1+2+3+\cdots+n}{1^2+2^2+3^2+\cdots+n^2}$ is .....
2. The Taylor's series of $f(z)$ about z = a is .....
3. The general form of Laplace equation is .....
4. If a periodic function f(x) is even, its Fourier expansion contains only .....
5. The complex Fourier transform is .....
6. A solution of a P.D.E, which contains as many arbitrary functions as the order of the equation is called .....
7. The stand form of a homogeneous linear partial differential equation of the n^{th} order with constant coefficients is .....

Answer the following

8. The series $\frac{1}{2}+\frac{\sqrt{2}}{3}+\frac{\sqrt{3}}{8}+\cdots+\frac{\sqrt{n}}{n^2-1}$ is convergent (or) divergent.
9. Find the analytic region of $f(z) = (x-y)^2 + 2i(x+y)$.
10. Find whether the series is convergent (or) divergent.
$1+\frac{1}{2^2}+\frac{1}{3^3}+\frac{1}{4^4}+\cdots$

II **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. For what value of p the series $\frac{2}{1^p}+\frac{3}{2^p}+\frac{4}{2^p}+\frac{5}{2^p}+\cdots\infty$ is convergent.
2. Find the Fourier cosine transform of e^{-x^2}.
3. Define Fourier sine transform.
4. Solve the equation $(D^3 - 7DD'^2 - 6D'^3)\,z = 0$
5. Solve $pq = z$
6. Define analytic function.
7. Find the poles of $f(z) = \frac{z^2+1}{1-z^2}$

III **Answer ANY FIVE of the following** **(5x4=20)**

1. Show that the series $\sum_{n=1}^{\infty} a_n$ converges absolutely if form a certain term on ward $\sqrt[n]{|a_n|} \leq q < 1$, where $q \geq 0$ is independent of n.
2. Find f(x), if its Fourier Sine transform is $\frac{s}{s^2+1}$
3. Find the Fourier series of period 2π for the function f(x) = $|\cos x|$ in $-\pi \leq x \leq \pi$
4. Solve the equation $(D^2 - 3DD' + 2D'^2)z = 2\cosh(3x + 3y)$
5. Find the partial integral of $(D^2 + 2DD' + D'^2)\,z = e^{x-y}$
6. Expand $f(z) = \frac{e^{2z}}{(z-1)^3}$ about z = 1 using Taylor's series expansion.
7. Show that $f(z) = \frac{1}{z}$ is analytic everywhere except at $z = 0$ and find $f'(z)$.

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1. Find the Fourier half-range sine series and cosine series of

$$f(x)=\begin{cases} x, & \text{in } 0<x<1 \\ 2-x & \text{in } 1<x<2 \end{cases}$$

2. An insulated metal rod of length 100 cm has one end A kept at 0° C and the other end B at 100°C until steady state condition prevail. At time t = 0, the temperature at B is suddenly reduced to 50°C and thereafter maintained, while at the same time t = 0, the end A is insulated. Find the temperature at any point of the rod at any subsequent time.

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