KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2021 Admission
II Semester Final Examination – September 2022

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

I **Define the following** **(10x1=10)**

1. Harmonic function
2. Conditional convergence
3. continuity of a complex valued function
4. Euler's formulae
5. Practical harmonic analysis

Answer the following

6. Write two dimensional heat flow equation.
7. State Cauchy's integral test.
8. Write the Cauchy Riemann equations in Cartesian form.
9. Write the Taylor's series of expansion of f(x).
10. State comparison tests (any one).

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

1. Obtain Taylor's series expansion of log(cosx) about the point x= $\frac{\pi}{3}$ upto 4^{th} degree term.
2. Find the analytical function f(z) whose imaginary part is e^x(x siny + y cosy)
3. Solve : p cotx + q coty = cotz
4. Find the Fourier series of f(x) = |x| in the interval $-\pi < x < \pi$
5. Verify Cauchy's theorem for the function $f(z) = ze^{-z}$ over the unit circle with origin as the centre.
6. Test the series for absolute convergence: $1-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+$--------
7. Using Cauchy's integral test, find the nature of the series $\frac{1}{e}+\frac{4}{e^2}+\frac{9}{e^3}+\frac{16}{e^4}$-----

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

1. Expand the function f(x) = x(2π-x) in a fourier series in (0,2π) and deduce that $\frac{\pi^2}{6}=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+$-------
2. Express f (x) = x as a half range cosine series and a half range sine series in the integral(0,2)
3. Solve (y+z) p + (z+x) q = x+y.
4. Show that u = $(r+\frac{1}{r})\cos\theta$ is harmonic. Find its harmonic conjugate. Also determine the corresponding analytic function.
5. Solve $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}=0$ by the method of separation of variables.
6. State and prove cauchy's integral theorem.
7. Find the solution of $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ subject to the conditions that u(o,t) = u(l,t) = 0 and u(x,o) = x, where l is the length of the base.

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

1. Test the series $1-\frac{1}{5}+\frac{1}{9}-\frac{1}{13}+$ ------ for
   (i) Convergence
   (ii) Absolute convergence
   (iii) Conditional convergence
2. Using Raabe's test, test the convergence the series $1+\frac{2}{3}x+\frac{2.3}{3.5}x^2+\frac{2.3.4}{3.5.7}x^3+$-------

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