



KERALA AGRICULTURAL UNIVERSITY
B. Tech.(Agri. Engg) 2017 Admission
II Semester Final Examination-July 2018

Sacs 1206

Engineering Mathematics II (2+1)

Marks: 50
Time: 2 hours

I Define the following in one Sentence.

(10x1=10)

- 1 Analytic function.
- 2 Absolute convergence.
- 3 Even and odd functions.
- 4 Maclaurin's series of $f(x)$.
- 5 Convergent and divergent series.
- 6 Cauchy's root test.
- 7 Cauchy Riemann equations in polar term
- 8 One dimensional heat flow equation
- 9 Fourier series for the function $f(x)$ in the interval $(\alpha, \alpha + 2\pi)$
- 10 D' Alembert's ratio test.

II Answer any FIVE of the following

(5x2=10)

- 1 Show that $f(z) = \sin z$ is analytic and hence find $f'(z)$
- 2 Using Maclaurin's series, expand $\log(1+x)$ and hence deduce that

$$\log \left[\sqrt{\frac{1+x}{1-x}} \right] = x + \frac{x^3}{3} + \frac{x^5}{5} + \dots$$

- 3 Solve : $pyz + qzx = xy$
- 4 Test the series for absolute convergence: $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$
- 5 Express $f(x) = x$ as Fourier series in the interval $-\pi < x < \pi$
- 6 Apply the Cauchy's root test to test the convergence for the series $1 + \frac{x}{2} + \frac{x^2}{3^2} + \frac{x^3}{4^3} + \dots$
- 7 Apply the Cauchy's root test to test the convergence for the series $1 + \frac{2^b}{2!} + \frac{3^b}{3!} + \frac{4^b}{4!} + \dots$

P.T.O

III Answer any FIVE of the following.

(5x4=20)

- 1 Test the series $\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{4}} - \frac{1}{\sqrt{5}} + \dots$ for conditional convergence

Expand the function

- 2 $f(x) = \begin{cases} 1 + 2x, & -3 \leq x \leq 0 \\ 1 - 2x, & 0 \leq x \leq 3 \end{cases}$ as Fourier series and deduce that $\frac{\pi^2}{8} = \sum \frac{1}{(2n-1)^2}$

- 3 Evaluate $\int \frac{dz}{(z^2+4)^2}$, where $c : |z + i| = 2$, by Cauchy's integral formula.

- 4 Solve $x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$

- 5 Solve $4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$, given $u = 3e^{-y} - e^{-5y}$ when $x = 0$ by the method of separation of variables.

- 6 Find a half range cosine and sine series for

$$f(x) = \begin{cases} x, & 0 \leq x \leq \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} \leq x \leq \pi \end{cases}$$

- 7 By Cauchy's root test, discuss the convergence of the series

$$1 + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 x^2 + \left(\frac{4}{5}\right)^3 x^3 + \dots \dots \dots$$

IV Answer any ONE of the following

(1x10=10)

- 1 Prove that the real and imaginary parts of an analytical function are harmonic.

- 2 Evaluate $\int_C \frac{dz}{z^2 - 4}$ over the following curves

- a. $C : |z| = 1$ b. $C : |z| = 3$ c. $C : |z + 2| = 1$
