KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Agrl. Engg.) 2020 Admission
II Semester Final Examination-October-2021

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

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

1. The value of $\frac{1}{1+x}$ in series form is __________.
2. If $u_n > 0$ for all finite n and $\frac{u_n}{u_{n+1}} = 1 + \frac{h}{n} + \frac{B(n)}{n^2}$ in which $B(n)$ is a bounded function for n to $n \to \infty$, and $\sum u_i$ converges for $h > 1$ and diverges for $h < 1$, then this series is called ____________.
3. The value of $\cos(2n\pi + nx) =$ _________ for n = 1, 2, 3……
4. A solution of a P.D.E, which contains as many arbitrary constants as the number of independent variable is called ____________.
5. The one dimensional heat flow equation is _________.
6. The Maclaurin's series of $f(z)$ is _________.
7. The Cauchy- Riemann in Cartesian form is __________.

Answer the following

8. Find the nature of the series $\frac{3}{4} + \frac{3.6}{4.7} + \frac{3.6.9}{4.7.10} + \ldots\ldots + \infty$
9. A periodic function of period 4 is defined as $F(x) = |x|$, $-2 < x < 2$. Find the Euler's Coefficient a_0 in its Fourier expansion.
10. Find the complementary function for $(D^3 + 2D^2D^1 - DD^{1^2} - 2\,D^{1^3})\,z = 0$

II Write Short notes on any FIVE of the following **(5x2=10)**

1. Find the value of Cauchy Ration test for $\lim_{n\to\infty} \frac{a_{n+1}}{a_n}$
2. Write half range cosine series.
3. What is the Fourier series of the function $\sin^3 x$.
4. Define Clairaut's form of PDE. Write its complete solution.
5. Solve $xp + yq = z$.
6. Show that the function $f(z) = xy + iy$ is continuous everywhere but not differentiable anywhere.
7. Evaluate $\int \frac{z}{z+2}\,dz$ where c is the unit circle $|z| = 1$.

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

1. Show that the p series test $\sum n^{-p}$, p = 0.999 is convergent.
2. Obtain the Fourier series of $f(x) = x^2$ in $-\pi < x < \pi$ and hence show that $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + \ldots\ldots = \frac{\pi^4}{90}$
3. Find the Cosine series for $f(x) = \frac{2}{\pi} - \frac{4}{\pi} \sum_{2,4,6}^{\infty} \frac{\cos nx}{n^2 - 1}$

4. Solve $\frac{\partial^3 z}{\partial x^3} - 3\,\frac{\partial^3 z}{\partial x^2\,\partial y} + 2\,\frac{\partial^3 z}{\partial x \partial y^2} = 0$
5. Use the method of separation of variables to solve the equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial y} + 2u$
6. Expand $f(z) = \frac{1}{(z-1)(z-2)}$ in a Laurent's series valid in the region $|z-1| > 1$
7. Find the residue and pole of the function $f(z) = \frac{(z-3)}{(z+1)(z+2)}$

IV Answer any ONE of the following **(1x10=10)**

1. Find the Fourier series expansion of $f(x) = x^2 + x$ in (-2, 2). Hence find the sum of the series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots \infty$
2. A uniform bar of length l through which heat flow is insulated at its sides. The ends are kept at zero temperature. If the initial temperature at the interior points of the bar is given by
   (i) $k \sin^3 \frac{\pi x}{l}$

   (ii) $k\,(lx - x^2)$

   for $0 < x < l$, find the temperature distribution in the bar after time t.

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