KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2023 Admission
II Semester Final Examination – July 2024

Beas.1207 | **Engineering Mathematics – II (2+0)** | **Marks: 50**
Time: 2 hours

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

1. One dimensional heat flow equation is ………………..
2. $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n =$ ………………….
3. A square matrix A is singular if $|A| =$ ……………
4. If A is orthogonal matrix then $AA^T =$ …………….,where A^T is the transpose of A
5. The series $1+x+x^2+x^3+$………..is convergent if |x|……………….

State True or False

6. The series 1+3+5+………is convergent.
7. For the equation of the type F(p,q)= 0 there is no singular integral.

Answer the following

8. Define analytic function.
9. State Cauchy Root Test.
10. Find the real part of e^z.

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

1. Find the values of x,y,z and a which satisfy the matrix equation $\begin{bmatrix} x+3 & 2y+x \\ z-1 & 4a-6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2a \end{bmatrix}$.
2. Prove that $U = \log(x^2+y^2)$ is harmonic.
3. Show that the Fourier series for $f(x) = 2x, \; -\pi < x < \pi$ is given by $f(x) = 4\sum_{n=1}^{\infty}(-1)^{n+1}\frac{\sin nx}{n}$
4. Show that $A = \begin{bmatrix} 2 & 3+4i \\ 3-4i & 2 \end{bmatrix}$ is Hermitian.
5. Find the partial differential equation by eliminating arbitrary constants from $z = ax + by + a^2 + b^2$
6. Test the convergence of the series $8-6-2+8-6-2+8-6-2+\cdots$.
7. Solve $\frac{\partial z^2}{\partial x^2} = \sin y$

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

1. If f(z) is regular function of z ,then prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$
2. Reduce the following matrix in to its normal form and hence find its rank
$$\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$$
3. Consider $f(z) = \frac{2xy(x+iy)}{x^2+y^2}$ if $z \neq 0$, $f(0) = 0$.
Show that f(z) satisfied C.R equation at origin but derivative of f(z) at origin does not exist.
4. Test the convergence of the series $\frac{1}{1.2.3}+\frac{3}{2.3.4}+\frac{5}{3.4.5}+\cdots$
5. Show that the series $\sum_{n=1}^{\infty}\frac{\cos nx}{n^p}$ converges uniformly in any interval

6. Find fourier series of the periodic function with period 2π is defined as

$$f(x) = \begin{cases} 0, -\pi \le x \le 0 \\ x^2, \quad 0 \le x \le \pi \end{cases}$$

7. Solve $\frac{\partial^2 z}{\partial x^2} + 4\frac{\partial^2 z}{\partial y^2} - 4\frac{\partial^2 z}{\partial x\, \partial y} = e^{3x+y}$.

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

1. Verify Cayley-Hamilton Theorcm for the matrix A $=\begin{bmatrix} 1 & 2 \\ 2 & --1 \end{bmatrix}$. Find A^{-1}. Determine A^8 .
2. Solve: px(x+y) = qy(x+y) – (2x+2y+z)(x-y)

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