Code: 5GC31

## R-15

II B.Tech. I Semester Supplementary Examinations May 2022

## Engineering Mathematics-III

( Common to CE \& ME )
Time: 3 Hours
Max. Marks: 70
Answer any five full questions by choosing one question from each unit ( $5 \times 14=70$ Marks )

## UNIT-I

1. a) Test for consistency and solve $5 x+3 y+7 z=4 ; 3 x+26 y+2 z=9 ; 7 x+2 y+10 z=5$
b) Show that the Eigen values of diagonal matrix are just the diagonal elements of the matrix

## OR

2. Verify Cayley-Hamilton theorem for the matrix $A=\left[\begin{array}{lll}1 & 1 & 2 \\ 3 & 1 & 1 \\ 3 & 3 & 1\end{array}\right]$ and hence find $A^{4}$.

UNIT-II
3. a) Find the missing term in the table

| $x$ | 2 | 3 | 4 | 5 | 6 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $y$ | 45 | 49.2 | 54.1 | - | 67.4 |

b) Find the Cubic polynomial which takes the values. $y(0)=1, y(1)=0, y(2)=1$ and

$$
y(3)=10
$$

## OR

4. a) Find the real root of the equation $x \log _{10} x=1.2$ by Regula-falsi method correct to four decimal places.
b) Using Lagrange formula find $f(4)$. Given

| $x$ | 0 | 2 | 3 | 6 |
| :--- | :--- | :--- | :--- | :--- |
| $y$ | -4 | 2 | 14 | 158 |

UNIT-III
5. Use Runge-Kutta method to evaluate $y(0.1)$ and $y(0.2)$ given that $y^{\prime}=x+y$, $y(0)=1$

## OR

6. Apply Fourth order Runge-Kutta Method to find an approximate value of y when $x=1.2$ in step of 0.1 , given that $y^{\prime}=x^{2}+y^{2}, y(1)=1.5$.
b) Find the half range cosine series for the function $f(x)=x$, when $0<x<\pi$ hence show that $\frac{1}{1^{2}}+\frac{1}{3^{2}}+\frac{1}{5^{2}}+\ldots=\frac{\pi^{2}}{8}$

## OR

8. Using the method of separation of variables, solve
$\frac{\partial u}{\partial x}=2 \frac{\partial u}{\partial t}+u$ where $\mathrm{u}(x, 0)=6 e^{-3 x}$

## UNIT-V

9. a) If $u=x^{2}+y^{2}$, find harmonic conjugate $v(x, y)$ and write the corresponding complex potential $f(z)=u+i v$
b) Show that the polar form of Cauchy's Riemann equations are $\frac{\partial u}{\partial r}=\frac{1}{r} \frac{\partial v}{\partial \theta}, \frac{\partial v}{\partial r}=\frac{1}{r} \frac{\partial u}{\partial \theta}$

## OR

10. Determine p such that the function $f(z)=\frac{1}{2} \log \left(x^{2}+y^{2}\right)+i \tan ^{-1}\left(\frac{p x}{y}\right)$ be an analytic function
