



VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

**DEPARTMENT OF MATHEMATICS
SCHOOL OF ADVANCED SCIENCES**

Fall Semester 2019-2020

Continuous Assessment Test-I, August-2019

Course Name: Applications of Differential and Difference Equations

Course Code: MAT 2002

Slot: F2+TF2

Max. Marks: 50 marks

Date & Time: 23.08.2019 & 90 minutes

Answer All the Questions

1. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to canonical form by

Orthogonal reduction and discuss its nature.

(10)

2. Use Cayley-Hamilton theorem to simplify $A^8 - 5A^7 + 7A^6 - 3A^5 + 8A^4 - 5A^3 + 2A + I$, if

$$A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$$

(10)

3. Find the Fourier series expansion for $f(x)$, if $f(x) = \begin{cases} -\pi & -\pi < x < 0 \\ x & 0 < x < \pi \end{cases}$.

Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

(10)

4. Obtain the first three coefficients in the Fourier cosine series for y , where y is given in the following table:

(10)

x	0	1	2	3	4	5
y	4	8	15	7	6	2

5. Obtain the Fourier series for $y = x^2$ in $-\pi < x < \pi$. Also, using the two values of y , show that

$$\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \dots = \frac{\pi^4}{90}$$

(10)