VIT
Vellore Institute of Technology

Fall semester 19 - 20
Continuous Assessment Test - 1
Programme Name & Branch: B. Tech

Course Name & Code: Applications of Differential and Difference Equations & MAT2002
Class Number: VL2019201000396, VL2019201000397, VL2019201000398, VL2019201000399 , VL2019201000400
Slot: B2+TB2
Exam Duration: 90 minutes
Maximum Marks: 50

Answer All the Questions (5 × 10 = 50)

1. By using the sine series for $f(x) = 1$ in $0 < x < \pi$, show that $\frac{\pi^2}{8} = 1+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+\ldots$

2. Compute the first two harmonics of the Fourier series of f(x) given in the following table.

θ	0°	60°	120°	180°	240°	300°	360°
T	1.0	1.4	1.9	1.7	1.5	1.2	1.0

3. Obtain the Fourier series for $y = x$ in $(0, l)$ and hence show that $1+\frac{1}{3^4}+\frac{1}{5^4}+\frac{1}{7^4}+\ldots = \frac{\pi^4}{96}$

4. Verify the Cayley – Hamilton theorem for the matrix $A=\begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$, show that $A^n = A^{n-2} + A^2 - I$. Hence find A^{50}.

5. Reduce the quadratic form $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$ to a canonical form by an orthogonal reduction and discuss it's nature. Also find the model matrix.