VIT
Vellore Institute of Technology

Winter Semester 2018-19

Continuous Assessment Test – I

Programme Name & Branch: B. Tech.

Course Name & Code: Applications of Differential and Difference Equations & MAT2002

Slot: D1+TD1

Exam Duration: 90 minutes

Maximum Marks: 50

Answer All the Questions (5 × 10 = 50)

S. No.	Question
1.	Find the Fourier series of $f(x)=\begin{cases}1+\frac{2x}{\pi} & ,-\pi\le x<0\\ 1-\frac{2x}{\pi} & ,0<x\le\pi\end{cases}$. Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+\dots=\frac{\pi^2}{8}$. **[10M]**
2.	The following table the shows variation of periodic function with period T= 2π. Obtain the first three harmonics. **[10 M]**

x	0	T/6	T/3	T/2	2T/3	5T/6	T
y	1.98	1.3	1.05	1.3	–0.88	–0.25	1.98

3.	Find the eigenvalues and eigenvectors for $A=\begin{bmatrix}2&2&1\\1&3&1\\1&2&2\end{bmatrix}$. **[10M]**
4.	Reduce the quadratic form $3x_1^2+2x_2^2+3x_3^2-2x_1x_2-2x_3x_2$ to canonical form by using orthogonal transformation and find the rank, index, signature and nature of the quadratic form. **[10M]**
5.	(a) Find the half range cosine series for $f(x)=(x-1)^2$ in the interval $0<x<1$. **[5M]** (b) Using Cayley-Hamilton theorem, find the inverse of $A=\begin{bmatrix}6&-2&2\\-2&1&-1\\2&-1&2\end{bmatrix}$. **[5M]**