VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act 1956)

Continuous Assessment Test – I

Programme Name & Branch: B.Tech.

Fall Semester -2019-20

Course Name & Code: APPLICATIONS OF DIFFERENTIAL AND DIFFERENCE EQUATIONS (MAT2002)

Slot: G2+TG2   Exam Duration: 90 minutes   Maximum Marks: 50

Section – A (10 x 5 = 50 Marks)*

S.No.	Answer all the questions	Course Outcome (CO)
1.	Find the Fourier series expansion of the following function $$f(x) = \begin{cases} 2 + x, & -2 \le x \le 0 \\ 2 - x, & 0 \le x \le 2 \end{cases}.$$ Hence show that $$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \infty = \frac{\pi^2}{8}.$$	CO1
2.	Compute the first two harmonics of the Fourier series of $f(x)$ as given in the following table. 	CO1
3.	Find the half range Fourier sine series for the following function $$f(x) = \begin{cases} x, & 0 < x \le \frac{\pi}{2} \\ \frac{\pi}{2}, & \frac{\pi}{2} < x \le \pi \end{cases}.$$	CO1
4.	Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{bmatrix}$. And hence, find A^{-1}	CO2
5.	Reduce the Quadratic form $Q = 5x^2 + 6y^2 + 7z^2 - 4xy + 4yz$ to canonical form, and hence find the rank, index, signature and nature of the quadratic form.	CO2

Table for Question 2:

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$
$f(x)$	9	18	24	28	26	20