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MID TERM EXAMINATIONS – April 2024

Programme	:	**B.Tech.**	Semester	:	**Winter 2023-24**
Course Title/ Course Code	:	**Differential and Difference Equations/ MAT2001**	Slot	:	**C12+C13**
Time	:	**1:30 hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Find the eigen value and eigen vector of the given matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 0 & 2 & -1 \\ 0 & 0 & 2 \end{bmatrix}$.	10
2		Find the solution of the given system of first order differential equations $\frac{dX}{dt} = \begin{bmatrix} -1 & -1 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -2 \end{bmatrix} X$ Where $X = [x_1\ x_2\ x_3]^T$.	10
3		Find two half-range expansions (a) the Fourier cosine series. (b) the Fourier sine series. of the given function (Fig. 1) $f(x) = \begin{cases} \frac{2k}{L}x, & if\ 0 < x < \frac{L}{2} \\ \frac{2k}{L}(L-x), & if\ \frac{L}{2} < x < L. \end{cases}$	10
4		Showing the details of your work, find the Fourier coefficients of the given function $f(x) = x^2,\ -\pi < x < \pi$ Also prove that $1 + \frac{1}{2^4} + \frac{1}{3^4} +, \ldots, = \frac{\pi^4}{90}$ by using Parseval's identity.	10
5		Find the Fourier cosine integral of $f(x) = \begin{cases} x^2, & if\ 0 < x < a \\ 0, & if\ x > a. \end{cases}$	10

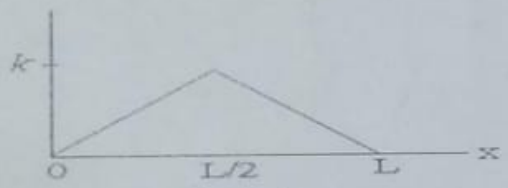

Fig. 1

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