	Reg. No.:	
	Name :	

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Midterm Examination – April 2021

Programme	:	**B.Tech. [BCE]**	Semester	:	**Winter 2020-21**
Course	:	**Differential and Difference Equation**	Code	:	**MAT2001**
Faculty	:	**Dr. Reena Jain**	Slot/ Class No.	:	**A11+A12/0419**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer all the Questions

Q.No.	Sub. Sec.	Question Description	Marks
1		An elastic membrane in the x_1x_2-plane is stretched so that a point $P(x_1, x_2)$ goes over into the point $Q(y_1, y_2)$ given by $$y_1 = x_1 + 0.5x_2$$ $$y_1 = 0.5x_1 + x_2$$ Find the **principal directions**, that is, the directions of the position vector $\boldsymbol{X}$ of P for which the direction of the position vector $\boldsymbol{Y}$ of Q is the same or exactly opposite.	**10**
2		Diagonalize the matrix $A = \begin{bmatrix} 4 & -3 & -3 \\ 3 & -2 & -3 \\ -1 & 1 & 2 \end{bmatrix}$ and verify $P^{-1}AP = D$ where P is the modal matrix and D is the diagonal matrix.	**10**
3		A voltage $v(t) = v_0 \cos\frac{1}{2}\pi t$ is passed through a half-wave rectifier that clips the negative portion of the wave. Develop the resulting portion of the function obtained in a Fourier Series.	**10**
4		Expand $f(x) = e^x, 0 < x < 2$ in a half range Fourier cosine series. Graph the corresponding periodic continuation of $f(x)$.	**10**
5		Find the function $f(x)$ if its Fourier transform is $$\bar{f}(\alpha) = \begin{cases} \frac{1}{2\pi} & -\infty < x < 0 \\ 0, & otherwise \end{cases}$$	**10**

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