International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Final Assignment Test Autumn-2020	Program: B.Sc. Engg. (EEE)
Course Code: **MATH-2309**	Course Title: **Math-III**
Time: **5 hours** (Writing - **4 hours 30 minutes** + **30 minutes** submission time)	Full Marks: **50** (**Written** 30 + **Viva/Viva-Quiz**-20)

[Answer each of the questions **(1-5)** from the following: Figures in the right margin indicate full marks.**]**

SET-B

1(a).	The given matrix is $\mathcal{J} = \begin{pmatrix} -b-1 & (a+2)-3i & 3+i \\ (a+2)-3i & 2 & 3-2i \\ 3-i & 3+2i & 5 \end{pmatrix}$ Then Justify that it is a Skew-Hermitian Matrix. Where a is the last digit, and bs is the second last of your metric ID.	**CO1**	**E**	**02**
1(b).	Solve the following Linear equation by using the justified inverse matrix method. $x + y + z = a + 1$, $x + 2y + 3z = b + 1$, $x + 4y + 9z = c + 1$. Where a is the last digit, b is the second last digit, and c is the 3rd last digit of your metric ID.	**CO2**	**Ap**	**04**
2(a).	The given matrix $\mathcal{H} = \begin{pmatrix} 3 & r & \frac{1}{3} \\ -2 & 1 & -1 \\ 5 & -1 & \frac{1}{3} \end{pmatrix}$ Verify the Callely Hamilton theorem, then determine the inverse matrix of B. Where r is the second odd digit of your metric ID, if there is no odd digit in your ID, then r will be the total number of your metric ID.	**CO1**	**Ap**	**04**
2(b).	If $A = \begin{pmatrix} 4 & m \\ l & \frac{1}{3} \end{pmatrix}$ determine its Eigenvalues and Eigenvectors. Where m is the second even digit of your metric ID, if there is no even digit in your ID, then l will be the largest digit of your metric ID.	**CO1**	**E**	**02**
3(a).	The given vectors are $\vec{a} = (l+1)\hat{\imath} - 3\hat{\jmath} + \hat{k}$, $\vec{b} = (m-1)\hat{\imath} + 3\hat{\jmath} + 3\hat{k}$, $\vec{c} = \hat{\imath} + \hat{\jmath} + \hat{k}$, then verify $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c})\,\vec{b} - (\vec{a} \cdot \vec{b})\,\vec{c}$ Where m is the second even digit of your metric ID, if there is no even digit in your ID, then m it will be the largest digit of your metric ID. Besides, m is the second last digit of your ID.	**CO1**	**R**	**02**
3(b).	If $\phi(x, y, z) = l - x^2 - y^2$, then find the directional derivative of ϕ at the point $P(1, 1)$ in the direction of $\vec{a} = \hat{\imath} + \hat{\jmath}$. Where l it will be the sum of the largest digit and the second smallest digit of your metric ID.	**CO2**	**E**	**04**
4(a).	If $\vec{A} = x^2 z^4\,\hat{\imath} - l y^3 z^2\,\hat{\jmath} + x y^2 z\,\hat{k}$, prove that, $\nabla \times (\nabla \times \vec{A}) = \nabla(\nabla \cdot \vec{A}) - \nabla^2 \vec{A}$, at the point $(l, -2, 2)$	**CO2**	**Ap**	**03**

	Where l is the largest digit of your metric ID.			
4(b).	If $\vec{F} = (2x - y + 2z)\hat{\imath} + (x + y - z)\hat{\jmath} + (3x - 2y - 5z)\hat{k}$, and C is the rectangle defined in the xy plane with the boundary $y = 0, x = a, and\ x = 0\ to\ y = 4 - b, hence$ Evaluate $\int_C \vec{F} \cdot \overrightarrow{dr}$. Where a is the last digit, and b is the first digit of your ID.	**CO2**	**E**	**03**
5.	Verify the Gauss divergence theorem for $\vec{F} = 4xz\,\hat{\imath} - y^2\,\hat{\jmath} + yz\,\hat{k}$ over the cube $x = 0, x = a, y = 0, y = a, z = 0, z = a$ Where a is the second smallest digit of your ID.	**CO2**	**E**	**06**
6.	Viva/Viva-Quiz: Time of viva/viva-quiz will announce later in google classroom.			**20**