Name of the Program: B. Sc.(CSE) **Date: 18th June, 2021**
Semester: 5th Sem. **Time: 2:30 PM – 4:00 PM**

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING(MPE)

Semester Mid Examination **Winter Semester:** 2020 - 21
Course Number: Math 4541 **Full Marks:** 75
Course Title: Multivariable Calculus and Complex Variables **Time:** 1.5 Hours

Answer all **three** questions. The symbols have their usual meanings. The examination is **Online**. Marks of each question and corresponding CO and PO are written in the brackets. You may not use your books, notes, or any programmable calculator and cell phone on this exam.

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1. (a) Find the four fourth roots of. $z = 1 + i$ **(8) (CO1)**

(b) Compute z^9 for $z = 1 + \sqrt{3}i$ **(9) (PO1)**

(c) Find the solution of $z^2\left(1 - z^2\right) = 16$ **(8)**

2. (a) Compute the limit of $\underset{x \to 1+i}{Lim} \dfrac{(3+i)z^4 - z^2 + 2z}{z+1}$ **(8) (CO1) (PO1)**

(b) Show that the complex function $f(z) = 2x^2 + y + i\left(y^2 - x\right)$ is not analytic at any point. **(8)**

(c) Verify that the function $u(x, y) = x^3 - 3xy^2 - 5y$ is harmonic in the entire complex plane. Also, find the harmonic conjugate function of *u*. **(9)**

3. (a) Find all solutions to the equation $\sin z = 5$. **(9) (CO1)**

(b) Calculate $\int_C \bar{z}dz$, where *C* is given by $x = 3t, y = t^2, -1 \le t \le 4$. **(8) (PO1)**

(c) Evaluate $\oint_C \dfrac{5z+7}{z^2+2z-3}dz$, where *C* is a circle represented by $|z - 2| = 2$. **(8)**