

B.Sc. Eng. (CSE)/ 5<sup>th</sup> Sem.

29 August, 2020

**ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)**

ORGANISATION OF ISLAMIC COOPERATION (OIC)

**DEPARTMENT OF MECHANICAL AND CHEMICAL ENGINEERING**

Online Examination

Winter Semester: 2019-2020

COURSE NO. : Math-4541

TIME : 1 Hours

COURSE TITLE: Multivariable Calculus and Complex Variables FULL MARKS: 40

**Instructions:**

1. There are **5 (Five)** questions. Answer any **4 (Four)** of them.
2. Exam time is 50 minutes and processing time to upload in google drive is 10 minutes.
3. Write the SET name on top of the answer script.
4. Follow your assigned group and submit the Answer script in that group within the mentioned time. Otherwise, your script will not consider for evaluation.
5. The figures in the right margin indicate full marks. The Symbols have their usual meaning.

1. Sketch in the  $xy$ -plane the domain of  $f(x, y) = \frac{\sqrt{4 - y^2}}{\ln(y - x^2)}$  10
  
2. The point  $(0, 1, 2)$  is on the surface 10  
 $\sin(2x)e^{(xz-2xy)} + \ln(y)\cos(x^{13}z^7) + (3y)^y \arctan(z - 2) = 0$ .  
 Find the tangent plane to this surface at the point  $(0, 1, 2)$ . Give your answer in the form  $ax + by + cz = d$ .
  
3. Considering the function  $f(x, y) = 2x + e^{-(x^2+y^2)} - \sin(xy) - 7$ . Find the 10  
 derivative of  $f$  in the direction parallel to the vector  $\vec{v} = \langle -3, \sqrt{7} \rangle$  at the point  $P_0(0, -1)$ . What is the direction in which  $f$  decreases most rapidly at  $P_0(0, -1)$ ?  
 Evaluate the following limit if it exists. Justify your answer. If it doesn't exist also justify why? 10
  
4. 
$$\lim_{(x,y) \rightarrow (0,0)} \frac{\sin(3x^2 + 3y^2)}{x^2 + y^2}$$
  
5. The volume of a rectangular solid of dimensions  $L$ ,  $W$  and  $H$  is given by the formula  $V = LWH$  10  
 Find the rate (in  $\text{cm}^3 / \text{s}$ ) at which the volume  $V$  is changing when the length  $L$  is 50 cm and increasing at the rate of 0.2 cm per second, the width  $W$  is 40 cm and increasing at the rate of 0.1 cm per second and the height  $H$  is 30 cm and decreasing at the rate of 0.1 cm per second.

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