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| **Student’s Name** | **Student’s ID** |
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| **Question Number** | **I** | **II** | **III** | **Total** |
| **Mark** |  |  |  |  |

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| ***Question I:* [6 Marks]****A.Describe the domain of** $f\left(x,y\right)=\sqrt{25-x^{2}-y^{2}}$ **and find the value of** $f\left(-3,0\right).$ |
| **B. Sketch the level curves of** $f\left(x,y\right)=4x^{2}+y^{2}$ **for**$k=0,4,16$**.****C. For**$f\left(x,y\right)=sin(x+y)e^{x-y}$**, Prove that** $\left(\frac{∂f}{∂x}\right)^{2}+\left(\frac{∂f}{∂y}\right)^{2}=2e^{2(x-y)}$ |
| ***Question II:*[6 Marks]****A. Show that** $\lim\_{(x,y,z)\to (1,0,2)}\frac{(2x-z)^{2}}{(x-1)^{2}+y^{2}+(z-2)^{2}}$ **does not exist:****B. Discuss the continuity of** $f(x,y)=\left\{\begin{array}{c}\frac{sin xy}{x^{2}}, \&(x,y)\ne (0,0)\\0, \&(x,y)=(0,0)\end{array}\right.$**at** $(0,0)$ |
| **C. Find the following limits:****(i)** $\lim\_{(x,y)\to (0,0)}\frac{y^{4}}{x^{2}+y^{2}}$**(i)** $\lim\_{(x,y,z)\to (1,0,1)}\frac{xy-zy}{x^{2}-z^{2}}$ |
| ***Question III:*[8 Marks]****If** $w=f(x,y)=\left\{\begin{array}{c}\frac{x^{3}y}{x^{4}+y^{2}}, \&(x,y)\ne (0,0)\\0, \&(x,y)=(0,0)\end{array}\right.$**A. Find**$f\_{x}(0,0)$ **and** $f\_{y}(0,0)$**B. Find**$∆w$ **at** $(0,0)$**C. Find expressions for** $ϵ\_{1}, ϵ\_{2}$ **that satisfy** $∆w=f\_{x}\left(0,0\right)∆x+f\_{y}\left(0,0\right)∆y+ϵ\_{1}∆x+ϵ\_{2}∆y$ **at** $(0,0)$**D. Is** $f$ **differentiable at** $(0,0)$**? Justify your answer** |

Good Luck ☺