United International **University**
School of Science and Engineering
Mid Assessment Trimester: Summer-2020
Course Title: Linear Algebra, Ordinary &Partial Differential Equations / Calculus and Linear Algebra
Course Code: Math 183/Math-2183 Marks: 20 Time: 1 Hour

Answer any one from 1 and 2, whereas 3 is mandatory. Figures are in the right hand margin indicating full marks. Answer all parts of a question together.

1.	For the function $\boldsymbol{f(x) = x^3 - 18x^2 + 2}$ find **(i)** Its stationary and inflection points. **(ii)** The intervals on which $\boldsymbol{f(x)}$ is increasing and decreasing. **(iii)** The intervals on which $\boldsymbol{f(x)}$ is concave up and down. **(iv)** Find the slope of the surface $z = f(x, y) = 2\sqrt{x^2 + y^2}$ in the x-direction at the point (3, 4). **(v)** Using chain rule find $\frac{\partial w}{\partial p}$, where $\boldsymbol{w = z\,sin(xy) + \sqrt{zy},\quad x = p + 2r, y = \frac{r}{2p}, z = r^2}$	**[10]**
2.	For the function $\boldsymbol{f(x) = x^3 - 9x^2 + 9}$ find **(i)** Its critical points and intercepts. **(ii)** Its relative maximum and minimum by using **1st** derivative test. **(iii)** Its relative maximum and minimum by using **2nd** derivative test. **(iv)** Find the slope of the surface $z = f(x, y) = 4\sqrt{x^3 + y^3}$ in the y-direction at the point (3, 3). **(vi)** Using chain rule find $\frac{\partial w}{\partial r}$, where $\boldsymbol{w = z\,cos(xz) + \sqrt{xy},\quad x = r + 2p, y = \frac{p}{2r}, z = r^2 + p^2}$	**[10]**
3.	**(a)** Find the solution of the given differential equations **i)** $\boldsymbol{ty' + 3y = 4t^2 + t}$ **ii)** $\boldsymbol{y' = \frac{e^{-x} - e^{x}}{3+4y}, \quad y(0) = 1}$ **(b)** Solve $\boldsymbol{(x^2 + xy + y^2)dx - x^2dy = 0}$	**[6]** **[4]**