Premier University
Department of Computer Science & Engineering
1st Semester Special Retake Final Year Examination, August 2020
Course Code: MAT 105 Course Title: Engineering Mathematics -I
Time: 1 Hour 30 minutes Full Marks: 50

NB: Answer any of five (5) questions. Each question carries equal marks.

Q-1	Discuss the point of discontinuity and draw graph of the function given by $f(x)=\begin{cases} -x, x\le 0 \\ x, 0<x\le 1 \\ 2-x, 1<x\le 2 \\ 1, x>2 \end{cases}$	07
Q-2	Find an open interval on which the following functions are increasing and decreasing (i) $f(x)=xe^{-x}$ (ii) $f(x)=x^3$	07
Q-3	If $y=e^{a\sin^{-1}x}$ then show that (i) $(1-x^2)y_2-xy_1-a^2y=0$ (ii) $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(n^2+a^2)y_n=0$	07
Q-4	Using appropriate chain rule find the $\frac{\partial w}{\partial s}$ and $\frac{\partial w}{\partial t}$ for $w=2xy$, where $x=s^2+t^2$ and $y=\frac{s}{t}$ at $s=1, t=2$	07
Q-5	Evaluate $\lim_{x\to 0}\frac{e^x-e^{-x}-2x}{x-\sin x}$ using L'Hospital rule. Verify Mean value theorem for $f(x)=x^2-4x$ in $[2,4]$	07
Q-6	Transform the equation $11x^2+24xy+4y^2-20x-40y-5=0$ to rectangular axes through the point $(2,-1)$ and inclined at an angle $\tan^{-1}\left(-\frac{4}{3}\right)$	07
Q-7	Test the nature of the equation $f(x,y)=8x^2+4xy+5y^2-16x-14y+13=0$ and also reduces to its standard form.	07

Q-8	Show that the maximum value of the function is	07
Q-9	If $u = 2(ax+by)^2 - (x^2+y^2)$ and $a^2+b^2=1$, then find the value of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$	07
Q-10	If $y = (\sin^{-1} x)^2$ then show that (i) $(1-x^2)y_2 - xy_1 - 2 = 0$ (ii) $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2 y_n = 0$	07