

**Premier University**  
**Department of Computer Science & Engineering**  
**1<sup>st</sup> Semester Special Retake Final Year Examination, August 2020**  
**Course Code: MAT 105**                      **Course Title: Engineering Mathematics -I**  
**Time: 2 Hours**                                      **Full Marks: 35**

**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 7

$$f(x) = \begin{cases} x, 0 \leq x < \frac{1}{2} \\ 1, x = \frac{1}{2} \\ 1-x, \frac{1}{2} < x < 1 \\ 1, x \geq 1 \end{cases}$$

Q-2 Find the maximum and minimum value of the function  $\left(\frac{1}{x}\right)^x$  7

Q-3 If  $y = e^{a \sin^{-1} x}$  then show that 7

(i)  $(1-x^2)y_2 - xy_1 - a^2y = 0$

(ii)  $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$

Q-4 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. 7

Q-5 Evaluate  $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x - \sin x}$  using L'Hospital rule. Verify Mean value theorem for  $f(x) = x^2 - 4x$  in  $[2, 4]$  7