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

$$f(x) = \begin{cases} x, 0 \le x < \dfrac{1}{2} \\ 1, x = \dfrac{1}{2} \\ 1-x, \dfrac{1}{2} < x < 1 \\ 1, x \ge 1 \end{cases}$$

Q-2
Find the maximum and minimum value of the function $\left(\dfrac{1}{x}\right)^x$ 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   7
also reduces to its standard form.

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