

Seat No. : _____

AC-140

April-2016

F.Y., MBA Integrated

Basic Mathematics

Time : 3 Hours]

[Max. Marks : 100

Instruction : Non-programmable Scientific Calculator can be used

1. Attempt any **four** : **20**

(1) Define function. Explain any two functions with graph.

(2) Find fog and gof if

$$f(x) = x^2 + 2 \text{ and } g(x) = 1 - \frac{1}{1-x}.$$

(3) If $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = x^2 - 3x + 2$, find $f(f(x))$.

(4) Classify the following function as Injection, Surjection or Bijection.

$$f : \mathbb{Q} - \{3\} \rightarrow \mathbb{Q} \text{ defined by } f(x) = \frac{2x+3}{x-3}.$$

(5) Find the domain and range of $f(x) = \sqrt{4-x^2}$.

2. Attempt any **four** : **20**

(1) Evaluate $\lim_{x \rightarrow 4} \frac{x^2 - 16}{\sqrt{(x^2 + 9)} - 5}$.

(2) Show that function $f(x)$ as defined below is dis-continuous at $x = 1/2$.

(3) Discuss the continuity of the function $f(x)$ at $x = 2$.

$$f(x) = \begin{cases} 2-x, & x < 2 \\ 2+x, & x \geq 2 \end{cases}$$

(4) Show that $\lim_{x \rightarrow 2} \left[\frac{1}{x-2} - \frac{1}{x^2-3x+2} \right] = 1$.

(5) Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{2+x} - \sqrt{2}}{x}$.

3. Attempt any **four** :

20

(1) Let $y = (3x^2 + 1)(x^3 + 2x)$, find $\frac{dy}{dx}$.

(2) Differentiate the function with respect to x

$$f(x) = \frac{e^x + \sin x}{1 + \log x}.$$

(3) If $y = (x^2 + x + 1)^4$, find $\frac{dy}{dx}$.

(4) If $y = \frac{\sqrt{1-x}}{1+x}$ prove that $(1-x^2)\frac{dy}{dx} + dy = 0$.

(5) Differentiate the function with respect to x

$$f(x) = \frac{e^x + e^{-x}}{e^x - e^{-x}}.$$

4. Attempt any **two** :

20

(1) If $y = x^x$ prove that $\frac{d^2y}{dx^2} - \frac{1}{y}\left(\frac{dy}{dx}\right)^2 - \frac{y}{x} = 0$.

(2) If $e^y(x+1) = 1$ show that $\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$.

(3) A monopolist has a demand function $x = 5 - 2P$

- Find : (i) Total revenue
(ii) Average revenue
(iii) Marginal revenue

5. Attempt any **two** :

20

(1) $A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{pmatrix}$ show that $A^3 - 6A^2 + 5A + 11I_3 = 0$. Hence, find A^{-1} .

(2) Find out the inverse of the following operation by Gauss elimination method :

$$\begin{aligned} x - 2y + 3z &= 4 \\ 2x + y - 3z &= 5 \\ -x + y + 2z &= 3 \end{aligned}$$

(3) The sum of three number is 6. If we multiply the third numbers 2 and add the first number to the result, we get 7. By adding second & third numbers to three times the first number we get 12. Use determinants to find the number.