

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

Department of Mathematics

Time : 1 hr. Full Marks : 10

No. of Students : 1600 Class Test, 2019 #

Subject: MA10001 Mathematics-I

NAME:.....SECTION NO: .....

Roll No:..... Signature:.....

Answer all the questions. Fill in the Blanks.

1. Consider the following function [2 MARKS]

$$f(x, y) = \begin{cases} \frac{x^2 y^2}{x^4 + y^2}, & (x, y) \neq (0, 0), \\ 0, & (x, y) = (0, 0). \end{cases}$$

Is  $f_y(x, y)$  is continuous at  $(0, 0)$ ? (TRUE/FALSE) FALSE

2. Let [1 MARK]

$$g(x, y) = \begin{cases} \frac{x^3 + y^3}{x - y}, & \text{when } x \neq y, \\ 0, & \text{when } x = y. \end{cases}$$

Is  $g$  continuous at  $(0, 0)$ ? (TRUE/FALSE) FALSE

3. Consider the initial value problem  $y^2 \frac{dy}{dx} - 19x^2 = 0$ ,  $y(0) = -2$ . Then the value of  $y(1) =$

$\sqrt[3]{11}$  [1 MARK]

4. The general solution of  $(1 + e^{-x}y - xe^{-x}y) dx + (xe^{-x} + 2) dy = 0$  is

$x + xe^{-x}y + 2y = C$  [2 MARKS]

5. The solution of the initial value problem  $6 \frac{dy}{dx} = 2y + xy^4$ ,  $y(0) = -1$  is

$y(x) = -\sqrt[3]{2} / (x - 1 + e^x)^{1/3}$   $y(-1) = \frac{-\sqrt[3]{2}}{(e^{-2})^{1/3}} = -1.40$  [2 MARKS]

6. The general solution of  $y''' - y'' + y' - y = 0$  is [1 MARK]

$C_1 e^x + C_2 \cos x + C_3 \sin x$

7. A particular integral of  $y'' - 16y = e^{-4x}$  is [1 MARK]

$-\frac{x e^{-4x}}{8}$  or  $-\frac{e^{-4x}}{8} (x - \frac{1}{8})$

\*\*\*\*\*GOOD LUCK\*\*\*\*\*

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1. Consider the following function [2 MARKS]

$$f(x, y) = \begin{cases} \frac{x^2 y^2}{x^4 + y^2}, & (x, y) \neq (0, 0), \\ 0, & (x, y) = (0, 0). \end{cases}$$

Is  $f_x(x, y)$  is continuous at  $(0, 0)$ ? (TRUE/FALSE) TRUE

2.  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y^2}{x^2 y^2 + (x^2 - y^2)^2} =$  Does not exist [1 MARK]

3. Consider the initial value problem  $y^2 \frac{dy}{dx} - 19x^2 = 0$ ,  $y(0) = 2$ . Then the value of  $y(1) =$

3 [1 MARK]

4. The general solution of  $(1 + e^x y + x e^x y) dx + (x e^x + 2) dy = 0$  is

$x + x e^x + 2y = C$  [2 MARKS]

5. The solution of the initial value problem  $6 \frac{dy}{dx} = 2y + xy^4$ ,  $y(0) = 1$  is

$y(x) = \sqrt[3]{2} / (e^x - x + 1)^{1/3}$  and  $y(-1) = \sqrt[3]{2} / (e + 2)^{1/3}$

[2 MARKS]

6. The general solution of  $y''' + y'' + y' + y = 0$  is

[1 MARK]

$C_1 e^{-x} + C_2 \cos x + C_3 \sin x$

7. A particular integral of  $y'' - 16y = e^{4x}$  is

[1 MARK]

$\frac{x e^{4x}}{8}$  or  $\frac{e^{4x}}{8} (x - \frac{1}{8})$