

**M.Sc. MATHEMATICS
SECOND SEMESTER
ORDINARY DIFFERENTIAL EQUATION II
MSM – 205 [REPEAT]
[USE OMR FOR OBJECTIVE PART]**

**SET
A**

Duration: 1:30 hrs.

Full Marks: 35

Time: 15 mins.

Marks: 10

Choose the correct answer from the following:

1×10=10

1. What is the order of the differential equation given by

$$\frac{dy}{dx} + 4y = \sin x$$

- | | | | |
|----|-----|----|---|
| a. | 0.5 | b. | 1 |
| c. | 2 | d. | 0 |

2. Given the differential equation $\frac{dy}{dx} = \frac{x^4 - y^4}{(x^2 + y^2)xy}$ the degree of differential equation is

- | | | | |
|----|---|----|---|
| a. | 1 | b. | 4 |
| c. | 0 | d. | 2 |

3. The process of formation of the differential equation is given in the wrong order, select the correct option from below given options.

- 1) Eliminate the arbitrary constants.
- 2) Differential equation which involves $x, y, \frac{dy}{dx}$.
- 3) Differentiating the given equation w.r.t x as many times as the number of arbitrary constants.

- | | | | |
|----|-------|----|-------|
| a. | 1,2,3 | b. | 3,2,1 |
| c. | 3,1,2 | d. | 2,1,3 |

4. What is the degree of first order differential equation, given by $\left(\frac{dy}{dx}\right)^{1.5} = \left(\frac{x \cos x}{x^2 + \sqrt{\sin x}}\right)^3$

- | | | | |
|----|-----|----|-----|
| a. | 1.5 | b. | 1 |
| c. | 3 | d. | 0.5 |

5. What is the order of the differential equation, $y'' + y' - x^3y = \sin x$

- | | | | |
|----|---|----|---|
| a. | 2 | b. | 1 |
| c. | 0 | d. | 3 |

6. Which one of the following is not a criterion for linearity of an ordinary differential equation?
- | | |
|---|--|
| a. The dependent variable y and its derivatives are of first degree | b. The derivatives of the dependent variable y should be of second |
| c. No product terms of y and/or any of its derivatives are present | d. No transcendental functions of y and/or its derivatives occur |
7. Which of the following is a type of Iterative method of solving non-linear equations?
- | | |
|----------------------------|------------------------------|
| a. Graphical method | b. Interpolation method |
| c. Trial and Error methods | d. Direct Analytical methods |
8. Which of the following is not an example of linear differential equation?
- | | |
|------------------|-------------------|
| a. $y' = mx + c$ | b. $x + x' = 0$ |
| c. $x + x^2 = 0$ | d. $x'' + 2x = 0$ |
9. Which of the following is not a standard method for finding the solutions for differential equations?
- | | |
|-------------------------|------------------------|
| a. Variable Separable | b. Homogenous Equation |
| c. Bernoulli's Equation | d. Orthogonal Method |
10. Solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = y^2x$ is _____
- | | |
|--------------------------------|------------------------------|
| a. $\frac{1}{y} = -x + c$ | b. $\frac{1}{xy} = -x + c$ |
| c. $\frac{1}{(xy)^2} = -y + c$ | d. $\frac{1}{xy} = -x^2 + c$ |

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(Descriptive)

Time : 1 hr. 15 mins.

Marks: 25

[Answer question no.1 & any two (2) from the rest]

1. Find the general solution of

5

$$x^2 \left(\frac{dy}{dx} \right)^2 - 2xy \frac{dy}{dx} + 2y^2 - x^2 = 0$$

2. a. Solve $p^2 - 5p + 6 = 0$

5+5=10

b. Solve $y = 2px - p^2$

3. a. Using the Picard's method of successive approximations, find the third approximation of the solution of the Equation $\frac{dy}{dx} = x + y^2$ where $y = 0$ when $x = 0$

5+5=10

- b. If S is defined by the rectangle $|x| \leq a, |y| \leq b$, Show that the $f(x, y) = x^2 + y^2$, satisfies the Lipschitz condition. Find the Lipschitz constant.

4. a. Examine the existence and uniqueness of solution of initial value problem $\frac{dy}{dx} = y^{\frac{1}{3}}, y(0) = 0$

5+5=10

b. Solve $\frac{d^2y}{dx^2} - y = x \sin x$

5+5=10

5. a. Solve $\frac{d^2y}{dx^2} + 4y = x \sin x$

b. Solve $(D^2 + 1)y = 8x^2 e^{2x} \sin 2x$

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