



UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Fourth Semester – 2020

Paper: Mathematics A-IV (Ordinary Differential Equations)

Course Code: MATH-203 / MTH-22309 Part-I (Compulsory) Time: 30 Min. Marks: 10

Roll No. in Fig.

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Signature of Supdt.:

ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer cutting and overwriting is not allowed. (10x1=10)

1. Solving $y''+6y'+9y = 0$, with $y(0) = 0$, $y(1) = 0$ is

- A) Initial value problem
- B) Boundary value problem
- C) Eigen value problem
- D) Three point boundary value problem

2. A particular solution of Nth order differential equation contains _____ arbitrary constants.

- A) N
- B) N+1
- C) N-1
- D) No constants

3. The differential equation $\frac{d^2y}{dx^2} + 6x^2 \frac{dy}{dx} + 9y = 2x + 3$ is

- A) Nonlinear
- B) Linear with constant coefficient
- C) Linear
- D) Homogenous

4. A differential equation is considered to be ordinary if it has.....

- A) One dependent variable
- B) One independent variable
- C) More than one dependent variables
- D) More than one independent variables

5. The Particular integral solution of the differential equation $(D^2 - 4D + 3)y = 20\cos x$ by the method of undetermined coefficients is.....

- A) $2 \cos x - 4 \sin x$
- B) $-3 \cos x - 4 \sin x$
- C) $2 \sin x - 4 \cos x$
- D) $2 \cos x$

6. If p and q are the degree and order of the differential equation $\left(\frac{d^2y}{dx^2}\right)^2 + 3\frac{dy}{dx} + \frac{d^3y}{dx^3} = 4$

then the value of $2p-3q$ is.....

- A) 7
- B) -7
- C) 3
- D) -3

7. The degree of the differential equation $\left(1 + \frac{dy}{dx}\right)^3 = 3\left(\frac{dy}{dx}\right)^2$ is.....

- A) 1
- B) 2
- C) 3
- D) 4

8. The order of the differential equation $\left(1 + \frac{dy}{dx}\right)^3 = 3\left(\frac{d^2y}{dx^2}\right)^2$ is.....

- A) 1
- B) 2
- C) 3
- D) 4

9. The auxiliary equation of $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$ is.....

- A) $m^2 + 6m + 9 = 0$
- B) $m^2 + 6m = 0$
- C) $m^2 + 9 = 0$
- D) $m^2 + m + 9 = 0$

10. The roots of auxiliary equation $2m^2 - 5m - 3 = 0$ are.....

- A) $-1/2, 3$
- B) $1/2, -3$
- C) $1, 2$
- D) $2, 3$



ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2. Solve the following:

(4x5=20)

a) Solve $2xy dx + (x^2 - 1) dy = 0$

b) Solve the initial value problem $\frac{dy}{dx} = (-2x + y)^2 - 7, y(0) = 0.$

c) Solve the boundary-value problem $\frac{d^2x}{dt^2} + 16x = 0, x(0) = 0, x\left(\frac{\pi}{2}\right) = 1.$

d) The function $y(x) = c_1 e^{3x} + c_2 e^{-3x}$ is a general solution of $\frac{d^2y}{dx^2} - 9y = 0.$ For what values of c_1 and c_2 , the general solution can be rewritten as $y(x) = 4 \sinh 3x - 5e^{-3x}.$

Q.3. Solve the following:

(3x10=30)

a) Solve $\frac{dy}{dx} + 2y = f(x), y(0) = 0,$ where $f(x) = \begin{cases} 1, & 0 \leq x \leq 3 \\ 0, & x > 3. \end{cases}$

b) Find the general solution of $y'' - 4y' + 4y = (x+1)e^{2x}.$

c) Find two power series solutions of the given differential equation

$(x^2 + 2)\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - y = 0$ about the ordinary point $x=0.$