



UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Fourth Semester – 2019

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.

Roll No. in Words.

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)

(i)	The solution of the differential equation $\frac{dy}{dx} = xy^{1/2}$ on the interval $]-\infty, \infty[$ is (a) $y = \frac{x^2}{4}$ (b) $y = \frac{x^2y}{4}$ (c) $y = \frac{x^4}{16}$ (d) $y = \frac{xy^4}{16}$
(ii)	Integrating factor of $x \frac{dy}{dx} - 4y = x^6 e^x$ is (a) -4 (a) $\frac{-4}{x}$ (a) $\frac{-4}{x^5}$ (a) none of these
(iii)	The initial value problem $y' = y, y(0) = 1$ has the solutions $y = e^x$ and $y =$ _____ (a) 0 (b) 1 (c) Ce^x (d) None of these
(iv)	The necessary and sufficient condition that $M(x, y)dx + N(x, y)dy$ be an exact differential is (a) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$ (b) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (c) $\frac{\partial^2 M}{\partial y^2} = \frac{\partial^2 N}{\partial x^2}$ (d) None of these
(v)	The Annihilator for $(x^2 e^{-3x} + 15x e^{-3x} + 2e^{-3x})$ is given by _____ (a) D^3 (a) $(D + 3)^3$ (a) $(D - 3)^3$ (a) D^2
(vi)	Classify the following differential Equation $(e^{2y} - y \cos xy)dx + (2xe^{2y} - x \cos xy + 2y)dy = 0$ (a) Exact (b) Separable (c) Homogenous (d) None of these
(vii)	The order of a differential equation is always (a) Positive integer (b) Negative integer (c) Rational number (d) Real number
(viii)	The Singular points of $(x^3 - 8)y'' - 2xy' + y = 0$ are given by _____ (a) 0 (b) 2 (c) $\sqrt{5}$ (d) None of these
(ix)	The integrating factor to convert the nonexact differential equation $(x + y)dx + x \ln x dy = 0$ into an exact equation is (a) $\frac{1}{x}$ (b) $\frac{1}{x^2}$ (c) $\ln x$ (d) none of these
(x)	Directional field of a differential equation $\frac{dy}{dx} = f(x, y)$ gives the analysis of the solution (a) Quantitatively (b) Qualitatively (c) Analytically (d) Numerically



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Paper: Mathematics A-IV (Ordinary Differential Equations)
Course Code: MATH-203 / MTH-22309 Part – II

Time: 2 Hrs. 30 Min. Marks: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q. 2		SHORT QUESTIONS	
(i)	Describe the following (a) Differential Equation (b) Explicit Solution (c) Exact Differential Equation	(4.5)	
(ii)	Determine the following functions are linearly independent or dependent on $]-\infty, \infty[$ $f_1(x) = x, f_2(x) = x^2, f_3(x) = 4x - 3x^2$.	(4.5)	
(iii)	Solve the following differential equation $x^2 y' + x(x+2)y = e^x$.	(5.5)	
(iv)	Solve the following differential equation $t^2 \frac{dy}{dt} + y^2 = ty$.	(5.5)	

LONG QUESTIONS		
Q.3	Solve the following D.E using variation of Parameter $y'' - 2y' + 2y = e^x \sec x$	(6)
Q.4	Solve the following differential equation using undetermined coefficients $y'' - 6y' = 3 - \cos x$	(6)
Q.5	Solve the following differential equation using an appropriate substitution $(x^2 + 2y^2) \frac{dx}{dy} = xy, y(-1) = 1$.	(6)
Q.6	Solve the following differential equation subject to the initial conditions $2y'' + 3y' - 2y = 14x^2 - 4x - 11, y(0) = 0, y'(0) = 0$.	(6)
Q.7	Find the power series solution of the following differential equation $y'' + (\cos x)y = 0$.	(6)