



REPUBLIC OF THE PHILIPPINES
PROVINCE OF CAVITE
CITY OF DASMARIÑAS

KOLEHIYO NG LUNGSOD NG DASMARIÑAS
City College of Dasmariñas



OFFICE OF THE VICE PRESIDENT FOR ACADEMICS AND PROGRAM IMPLEMENTATION

**INSTITUTE OF ENGINEERING
MIDTERM EXAMINATION
CEMAT104: DIFFERENTIAL EQUATIONS**

Name		ID No.	
Section		Date	

GENERAL DIRECTIONS:

1. Be on time. Latecomers will not be allowed to take the exam.
 2. Use of calculators, gadgets, and reference materials are not allowed. Upon inspection, all accessories, watches, IDs and other stuffs must be placed in the bags.
 3. Provide what is/are asked from the following problems. Use black/blue pen.
 4. Scratch papers and answer sheets (**FOR FINAL AND COMPLETE COMPUTATIONS AND SOLUTIONS**) shall be provided by the proctor. Students are not allowed to bring extra papers. Should the students need additional sheets, they must ask the assigned proctor. The first bond paper is for FINAL COMPUTATIONS and ANSWERS, while the last bond papers are for draft computations (scratch papers). Write your names in and label (final or scratch) the bond papers.
 5. The point distribution for every set of complete computations and correct solutions is one point each.
 6. Once the exam has started, no one shall be allowed to leave the room for whatever/any reason. Should the students insist/request to leave, they need to submit their papers, and that concludes their examination time.
 7. Any form of dishonesty will never be tolerated.
- A. Compare and contrast, and provide examples for the following DE terminologies:
- 1-2. Dependent and Independent Variables
 - 3-4. Ordinary and Partial DE
 - 5-6. Order and Degree of DE
 - 7-8. General and Particular Solutions
 - 9-10. Arbitrary Constant, Particular Constant, and Parameter
 - 11-12. Linear and Non-linear DE
 - 13-14. Homogenous and Non-homogenous DE

- B. Identify the order and degree of the following DE (solve, if applicable):

#	Problem	#	Problem
15	$\left(\frac{d^3y}{dx^3}\right)^{\frac{2}{3}} = \sqrt{1 + \frac{d^2y}{dx^2}}$	17	$\ln\left(\frac{d^2y}{dx^2}\right) + \frac{dy}{dx} = x$
16	$\left(\frac{d^2y}{dx^2}\right)^{-\frac{2}{3}} + \left(\frac{dy}{dx}\right)^{\frac{2}{3}} = x\left(\frac{d^2y}{dx^2}\right)^{\frac{1}{3}}$	18	$\Delta^2\phi = 0$

- C. Verify the solutions

19	Show that $u(x,y) = \cos x \sinh y + \sin x \cosh y$ is a solution of Laplace's equation: $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$
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20	Bessel's function of index zero is defined by the power series: $J_0(x) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(n!)^2 2^{2n}}$ Verify that $J_0(x)$ is a solution of the differential equation $xy'' + y' + xy = 0$
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D. Eliminate the arbitrary constant (verify the solutions).

#	Problem	#	Problem
21	$y = Ae^{2x} + Bxe^{2x}$	23	$y = C_1 e^{2x} \cos 3x + C_2 e^{2x} \sin 3x$
22	$x = c_1 \cos \omega t + c_2 \sin \omega t$ ω is a parameter	24	$y = c_1 x^2 + c_2 e^{2x}$

E. Obtain the DE of the following families of curves (provide the graphical representations):

25. Straight lines with algebraic sum of the intercepts fixed as α
26. All circles
27. All parabolas
28. Parabolas with axis parallel to the y -axis and with distance from the vertex to focus fixed as k
29. Straight lines passing through a fixed point (a, b) in Quadrant 3
30. Parabolas with axis parallel to x -axis

F. Solve the following DE:

#	Problem	#	Problem
31	$\sin x \sin y \, dx + \cos x \cos y \, dy = 0$	37	$(2a^2 - r^2)dr = r^3 \sin \theta \, d\theta$ when $\theta = 0; r = a; a$ is constant
32	$y \ln x \ln y \, dx + dy = 0$	38	$xy^3 dx + e^x dy = 0$ when $x \rightarrow \infty, y = \frac{1}{2}$
33	$(x - y \ln y + y \ln x)dx + x(\ln y - \ln x)dx = 0$	39	$(y - \sqrt{x^2 + y^2})dx - xdy = 0$ when $x = 0, y = 1$
34	$y' = x - 2y \cot 2x$	40	$L \frac{di}{dt} + Ri = E$ when $t = i = 0; L, R, E$ are constants
35	$(\cos x \cos y - \cot x)dx - \sin x \sin y dy = 0$	41	$3y(x^2 - 1)dx + (x^3 + 8y - 3x)dy = 0$ when $x = 0, y = 1$
36	$2x^3 y' = y(y^2 + 3x^2)$	42	$(y^4 - 2xy)dx + 3x^2 dy = 0$ when $x = 2, y = 1$

