

University of Barishal
 Department of Computer Science and Engineering
 1st Year, 2nd Semester, Final Examination, 2023,
 Session 2022-2023, Course code: Math 1209

Course Title: Integral Calculus, Ordinary and Partial Differential Equations and Series Solutions
 Full Marks: 60 Time: 03 Hours

N.B: Answer any Five (05) questions out of the following.

1	a)	Demonstrate the differences between differential and Integral Calculus using an example.	3
	b)	Solve the following integral problems. i) $\int \frac{x^3 + 5x^2 - 4}{x^2} dx$ ii) $\int 3x^2 \sqrt{x^3 + 1} dx$ ii) $\int 4x \cos(2 - 3x) dx$	3+3 +3
2	a)	Solve the following integral problem: $\int \frac{2x+1}{\sqrt{4x-1}} dx$	3
	b)	You are given the following differential equation. Solve the differential equation to find the original equation: $\frac{dy}{dx} + \frac{(y \cos x + \sin y + y)}{\sin x + x \cos y + x} = 0$	5
	c)	Solve the following definite integral problem. $\int_0^{\frac{\pi}{2}} x^2 \sin x dx$	4
3	a)	Solve the following finite integral problem. $\int_{-1}^2 (4x^5 - 6x - 5) dx$	3
	b)	Calculate the area bounded between the x-axis and the parabola $y = 4x - x^2$	4
	c)	Calculate the area bounded between the parabola $y^2 = 4x$ and the line $y = 2x - 4$.	5
4	a)	Given the following differential equation, solve for the original equation: $(x + 1) \frac{dy}{dx} - y = e^{3x} (x + 1)^2$	4
	b)	Determine the volume of the solid by rotating the region bounded by $y = x^2 - 4x + 5$, $x = 1$ and $x = 4$. x-axis will be considered the rotation axis.	4
	c)	Determine the volume of the solid rotating the region bounded by $y = \sqrt[3]{x}$ and $y = \frac{x}{4}$. The y-axis will be considered the rotation axis.	4

17/12/2024 14:59

5	a)	Find the generic formulation to solve $\int \sin^n dx$ where n is an even integer number. Using the formulation solve for $\int \sin^4 dx$.	6
	b)	Find the order and degree of the following differential equation. Explain your findings. $y = x\left(\frac{dy}{dx}\right) + a\left\{1 + \left(\frac{dy}{dx}\right)^2\right\}^{\frac{1}{2}}$	2
	c)	Given an equation $y = e^{mx}$ where m is a constant, find a differential equation for the given function removing all the constants.	4
6	a)	Find the generic formulation to solve $\int \cos^n dx$ where n is an odd integer number. Using the formulation solve for $\int \cos^5 dx$.	5
	b)	Given an equation $y = c(x - c)^2$, find a differential equation for the given function. Here c is a constant.	4
	c)	Given a differential equation $\frac{dy}{dx} = -\frac{x}{y}$, find the original equation removing the differential operator.	3
7	a)	Given a differential equation, $e^y \tan y dx + (1 - e^x) \sec^2 y dy = 0$, find the original equation removing the differential operator.	4
	b)	Solve for the following equation, $(x + y)^2 \frac{dy}{dx} = a^2$	4
	c)	Solve for the following differential equation, $\frac{dy}{dx} = \sin(x + y) + \cos(x + y)$	4
8	a)	Solve for the following homogenous differential equation: $(x^3 + 3xy^2) dx + (y^3 + 3xy^2) dy = 0$	4
	b)	Given the following non-homogenous differential equation, solve it to find the original equation: $\frac{dy}{dx} = \frac{x + 2y - 3}{2x + y - 3}$	4
	c)	You are given the following differential equation. Solve it to find the original equation: $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$	4

17/12/2024 14:59