


National University of Computer and Emerging Sciences, Lahore Campus			
	Course:	Differential Equations(Calculus-II)	Course Code: MT 224
	Program:	BS (CS, SE, DS)	Semester: Spring
	Duration:	3 hours	Total Marks: 100
	Paper Date:	01-07-2021	Weight: 70%
	Section:	All	Page(s): 1
	Exam:	Final	Roll No: 20L-1080
Instruction/Notes:	Attempt All Questions, Exchange of calculators or programmable calculators not allowed at all.		
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Question:1[CLO:1, 5]

[10+10marks]

- a. Use any method to determine if the series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{n!2^n}{n^n}$$

- ✓b. Find Fourier series of f on the given interval.

$$f(x) = \begin{cases} 0, & -\pi < x < 0 \\ 1, & 0 \leq x < \pi \end{cases}$$

Question:2[CLO:2, 3]

[10+10marks]

Solve the following differential equations.

✓a. $ydx = 4(x + y^6)dy, y(1) = 1$

✓b. $(y^2 + yx)dx + x^2dy = 0.$

Question:3[CLO: 3]

[10+10marks]

- ✓a. A certain culture of bacteria grows at rate proportional to its size. If the initial size is p_0 which doubles in 4 days, find the time required for the culture to increase to 10 times to its initial size.
- ✓b. Solve the following Cauchy Euler Equation.

$$x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 2y = 0$$

✓Question:4[CLO: 4]

[20marks]

Solve the given differential equation subject to the indicated condition by method of undetermined coefficients by any approach.

$$y'' - y = x + \sin x, y(0) = 2, y'(0) = 3$$

✓Question:5[CLO: 5]

[20marks]

Find the product solutions for the given Partial Differential Equation using Separation of Variables Method.

$$k \frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$$

Subject to the conditions: $u(0, t) = 0, u(L, t) = 0, u(x, 0) = x(L - x)$