National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	Diff. Eq. (Cal-II)	Course Code:	MT-1006
	Program:	BS(CS)/BS(DS)	Semester:	Spring 2022
	Duration:	60 mins	Total Marks:	30
	Date:	22-03-2022	Weight	15%
	Section:	All	Page(s):	1
	Exam:	Mid 1	Roll No:	
Name:				

Note: Attempt all questions. Use of programmable calculators is not allowed. Exchange of stationary is strictly prohibited. Best of luck!

converge → 0

Question no. 1: (5 marks) Find a formula for the ***nth* term** of the sequence $\{\frac{3}{5}, \frac{4}{25}, \frac{5}{125}, \frac{6}{625}, \frac{7}{3125}, \dots\}$. Is the sequence convergent? If yes, to what value does it converge?

diverge

Question no. 2: (5 marks) Use integral test to determine whether the series $\sum_{n=0}^{\infty} \frac{3n^2}{2n^3+2}$ converges or diverges.

$\frac{1}{2}\ln(2n^3+2)$ ∞

Question no. 3: (5 marks) Check whether the series $\sum_{n=0}^{\infty} \frac{\sqrt{n^2+4n+1}}{n^3+9}$ converges or diverges using limit comparison test.

$1/n^2 = 1 > 0$ converge p series

Question no. 4: (10 marks) For what values of x does the series $\sum_{n=1}^{\infty} \frac{(-1)^n(x-1)^n}{(2n-1)2^n}$ converge absolutely and for what values of x does it converge conditionally?

$-1 < x < 3$

conditionally

Question no. 5: (5 marks) Find the Taylor series for $f(x) = e^{-2x}$ at $a = 3$. Write the summation form of the series.

$$\frac{(-1)^n (2^n) e^{-6} (x-3)^n}{n!}$$

$\frac{1}{\alpha} \ln(2n^3+2)$

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	Course:	Diff. Eq. (Cal-II)	Course Code:	MT-1006
	Program:	BS(CS)/BS(DS)	Semester:	Spring 2022
	Duration:	3 hours	Total Marks:	70
	Date:	10/06/22	Weight	50%
	Section:	All	Page(s):	2
	Exam:	Final	Roll No:	
Name:	T;			

Note: Attempt all questions. Use of programmable calculators is not allowed. Exchange of stationary is strictly prohibited. Best of luck!

Question no. 1: (CLO-01) (10 marks)

a) Use ratio test to determine if the series

$$\sum_{n=2}^{\infty} \frac{3^{n+2}}{\ln n}$$

converges or diverges.

b) Ayesha puts 1 coin on the first square of an 8×8 chess board. Then she puts double the amount of coins in each successive square thereafter. How many coins would be on the 64th square?

Question no. 2: (CLO-02) (10 marks) Solve the given initial value problem.

$$L\frac{dy}{dt} + Ry = E, y(0) = y_0$$

where L, R, E and y_0 are constants.

Question no. 3: (CLO-02) (10 marks) Suppose that in winter the daytime temperature in a certain office building is maintained at 70°F. The heating is shut off at 10 P.M. and turned on again at 6 A.M. On a certain day the temperature inside the building at 2 A.M. was found to be 65°F. The outside temperature was 50°F at 10 P.M. and had dropped to 40°F by 6 A.M. What was the temperature inside the building when the heat was turned on at 6 A.M.?

National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	Differential Equations (Cal-2)	Course Code:	MT-224
	Program:	BS (CS)	Semester:	Spring
	Duration:	1 hour	Total Marks:	25
	Paper Date:	3-3-22	Weight	
	Section:	Section N	Page(s):	
	Exam:	Quiz 1	Roll No:	
Instruction/Notes:	Attempt All Questions			

[5 marks]

Question#1:

Does the sequence whose nth term is $a_n = (\frac{n+1}{n-1})^n$ converge? Is so, find $\lim_{n\to\infty} a_n$.

[5 marks]

Question#2:

Write out the first eight terms of the given series to show how the series starts. Then find the sum of the series or show that it diverges.

$$\sum_{n=0}^{\infty}(\frac{5}{2^n} + \frac{1}{3^n})$$

[5 marks]

Question#3:

Use the nth- term divergence test of the given series

$$\sum_{n=1}^{\infty} \frac{n(n+1)}{(n+2)(n+3)}$$

[5marks]

Question: 4

If the series converges, find its sum.

$$\sum_{n=0}^{\infty} \frac{2^n - 1}{3^n}$$

[5 marks]

Question: 5

Use the integral test to determine if the series converge or diverge. Check the conditions of integral test.

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

National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	Diff. Eq. (Cal-II)	Course Code:	MT-1006
	Program:	BS(CS)/BS(DS)	Semester:	Spring 2022
	Duration:	60 mins	Total Marks:	40
	Date:	07/05/22	Weight.	15%
	Section:	All	Page(s):	1
	Exam:	Mid 2	Roll No:	
Name:				

Note: Attempt all questions. Use of programmable calculators is not allowed. Exchange of stationary is strictly prohibited. Best of luck!

Question no. 1: (CLO-02) (10 marks) Solve the initial value problem that consists of differential equation $x \sin y\, dx + (x^2 + 1) \cos y\, dy = 0$ and the initial condition $y(1) = \frac{\pi}{2}$.

Question no. 2: (CLO-02) (10 marks) Identify the equation and solve it using appropriate substitution method

$$y' + \frac{1}{3}y = e^x y^4$$

Question no. 3: (CLO-03) (10 marks)

Determine whether the equation $2xydy + (4x + 3y^2)dx = 0$ is exact. If not, make it exact and solve the differential equation.

Question no. 4: (CLO-03) (10 marks) A tank contains 400 gal of brine in which 100 lb of salt is dissolved. Fresh water runs into the tank at the rate of 2 gal/min, and the mixture, kept practically uniform by stirring, runs out at the same rate. How much salt will be left in the tank at the end of 1 hour?

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	Course:	Diff. Eq. (Cal-II)	Course Code:	MT-1006
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Note: Attempt all questions. Use of programmable calculators is not allowed. Exchange of stationary is strictly prohibited. Best of luck!

Question no. 1: (CLO-02) (10 marks) Solve the initial value problem that consists of differential equation $x \sin y \, dx + (x^2 + 1) \cos y \, dy = 0$ and the initial condition $y(1) = \frac{\pi}{2}$.

$y = \sin^{-1}\left(\frac{a}{x^2+1}\right)$

Question no. 2: (CLO-02) (10 marks) Identify the equation and solve it using appropriate substitution method

$$y' + \frac{1}{3}y = e^x y^4$$

$y^{-3} = -3x e^x + c e^x$ Bernoulli

Question no. 3: (CLO-03) (10 marks)

Determine whether the equation $2xydy + (4x + 3y^2)dx = 0$ is exact. If not, make it exact and solve the differential equation.

$x^4 + x^3 y^2$

Question no. 4: (CLO-03) (10 marks) A tank contains 400 gal of brine in which 100 lb of salt is dissolved. Fresh water runs into the tank at the rate of 2 gal/min, and the mixture, kept practically uniform by stirring, runs out at the same rate. How much salt will be left in the tank at the end of 1 hour?

$\frac{dA}{dt} = \frac{-A}{200}$ 99.5

$100 e^{-1/200}$

$2xy$

$2x^3 y \, dy + (4x^3 + 3x^2 y^2) \, dx = 0$