COMSATS University Islamabad

Lahore Campus

Final Exam– Fall 2021

Course Title:	**Calculus and Analytical Geometry**		Course Code: MTH104	Credit Hours:	3(3,0)
Course Instructor/s:	**Dr. Madiha Qayyum, Dr. Madiha Khalid, Dr. M. Kamran Siddiqui, Ms Aqsa Farooq, Ms Rabia**		Program Name:		
Semester:	[redacted]	Section:	A, B, C	Date:	05-01- 2022
Time Allowed:	**180 minutes**		**Maximum Marks:**		50
Student's Name:	[redacted]		Reg.No	[redacted]	

Important Instructions / Guidelines:

- All questions carry equal marks. (10*5)=50

Note: Attempt all questions

Q.1. (a)Solve inequality and show its solution set on real line

$$|2x-5| \leq 7$$

(b)Find the interval on which the function $f(x)$ is increasing or decreasing. If

$$f(x) = 2x^2 - 2x - 12$$

Q.2. Solve integral by tabular method or by integration by parts

$$\int (2x^4 - 8x^3)e^{-3x}\, dx$$

Q.3 Solve integral by partial fraction method if $\int \frac{x^2}{(2x+1)(x+2)^2}\, dx$

Q.4. Determine whether the sequence $\{a_n\}$ converges or diverges, if it converges find its limit

$$a_n = \frac{e^n + e^{-n}}{e^n - e^{-n}}$$

Q.5. Find the sum of the infinite series

$$\sum_{k=1}^{\infty}\left[\frac{1}{7^{k-1}}\right]$$

Q.6. Determine convergence or divergence of the series by Integral Test.

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

Q.7. (a) Solve by using L-Hospital rule,

$$\lim_{x\to 1}\ \frac{\ln x}{x-\sqrt{x}}$$

(b) Solve Limit by indeterminate form method,

$$\lim_{x\to 0}\ x^{4x}$$

Q.8. Determine whether the series Converges or Diverges by Ratio Test.

$$\sum_{k=1}^{\infty}\frac{(-1)^k\ k^2\ k!}{(2k)!}$$

Q.9. Determine whether the series Convergence or divergence by Root Test.

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

Q.10.(a) Find center, the radius of convergence and interval of convergence for

$$\sum_{k=0}^{\infty}\frac{3^k(x-5)^{2k}}{k^2}$$

(b) Find the Maclaurin series for $f(x)=\cos(5x)$ at $x=0$.