	R (I	Residential Autonomous College affiliated to University of Calcutta)	
		FIRST YEAR [BATCH 2018-21] B.A./B.Sc. SECOND SEMESTER (January – June) 2019 Mid-Semester Examination, March 2019	
Date	: 28/03/2019	MATH FOR INDUSTRIAL CHEMISTRY (General)	
Time	: 11 am – 12 noon	Paper : II Full Mar	ks : 25
[Use a separate Answer Book <u>for each group]</u> <u>Group – A</u>			
		(Answer <u>any one</u> question)	[1×5]
1.	a) Let, position vect ratio m : n interna	tors of two points A and B are \vec{a} and \vec{b} respectively. A point P divides AB in the ally. Find the position vector of the point P.	e [3]
	b) Two proper vecto	ors \vec{a} and \vec{b} such that each of them is a scalar multiple to the other. Prove that	
	\vec{a} and \vec{b} are collin	near vectors.	[2]

2. Show that the line through P(4,-3,-1) and parallel to the vector (1,4,7) is

$$\frac{x-4}{1} = \frac{y+3}{4} = \frac{z+1}{7}$$
. Also find two points on it at a distance of $\sqrt{1056}$ from P. [3+2]

<u>Group – B</u>

(Answer <u>any two</u> questions) [2×5]

3. Test the convergence of the series

 $1 + \frac{1}{2} \cdot \frac{1}{3} + \frac{1 \cdot 3}{2 \cdot 4} \cdot \frac{1}{5} + \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6} \cdot \frac{1}{7} + \dots$

- 4. Write down Taylor's infinite series for $f(x) = \sin x, x \in \mathbb{R}$.
- 5. State Cauchy's mean value Theorem (on differentiation). Verify the conclusion of the theorem for the pair of functions $f:\left[\frac{\pi}{4},\frac{3\pi}{4}\right] \rightarrow \mathbb{R}$ and $g:\left[\frac{\pi}{4},\frac{3\pi}{4}\right] \rightarrow \mathbb{R}$

defined by $f(x) = \sin x$, $g(x) = \cos x$.

[2+3]

[1×5]

<u>Group – C</u> (Unit-I)

(Answer <u>any one</u> question)

7. Evaluate:

$$\lim_{n \to \infty} \left[\frac{1}{n} + \frac{\sqrt{n^2 - 1^2}}{n^2} + \dots + \frac{\sqrt{n^2 - (n - 1)^2}}{n^2} \right]$$
[2.5]

8. a) Integrate:
$$\int \frac{dx}{a+b\cos x}$$
, if $a > b$.
b) Integrate:
$$\int \frac{x^3 dx}{(x-a)(x-b)(x-c)}$$
. [2.5+2.5]

(Unit-II) [1×5]

(Answer <u>any one</u> question)

- a) If $P(A|B) = \frac{1}{3}$, $P(B) = \frac{1}{4}$ and $P(A) = \frac{1}{2}$, find the probability that exactly one of the events A and B 9. occurs.
 - b) If P(A) = a and P(B) = b, show that $P(A | B) \le \frac{a}{b}$. [3+2]
- 10. A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. They shot simultaneously. Find the probability that

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at least 2 shots hit,

- i) ii) at most 2 shots hit,

iii) at least 1 shot hits. iv) 2 shots hit the target.

[5]