RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2018-21]

B.A./B.Sc. THIRD SEMESTER (July – December) 2019

Mid-Semester Examination, September 2019

Date : 18/09/2019 **MATH FOR INDUSTRIAL CHEMISTRY (General)**

Time : 11 am – 12 noon **Paper: III** Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

Answer **any three** questions **:** (3 × 5)

1. Find the angle between the chords of the curve $x^2+y^2=ax+by$ obtained by joining the origin to the points of intersection of the straight line $\frac{x}{a}+\frac{y}{b}=1$ and the given curve. 5

2. Find the locus of poles of tangents to the parabola $ay^2+2b^2x=0$ with respect to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. 5

3. Reduce $3x^2+10xy+3y^2-12x-12y+4=0$ to its canonical form. 5

4. Find the polar equation of the tangent to the conic $\frac{2}{r}=1-\cos\theta$ at $\theta=\frac{\pi}{2}$. 5

5. Find the equation of the plane passing through $(1,2,3)$ and parallel to $3x+4y-5z=0$. 5

Group – B

Answer **any two** questions**:** (2 × 5)

6. a) Define a vector space over a field . 3

   b) Examine if the set S is a subspace of $\mathbb{R}^3$, where $S=\{(x,y,z)\in\mathbb{R}^3 : x+y+z=0\}$. 2

7. a) Determine k so that the set S is linearly dependent in $\mathbb{R}^3$, where $S=\{(1,2,1),(k,3,1),(2,k,0)\}$. 2

   b) Find a basis for the vector space $\mathbb{R}^3$, that contains the vectors $(1,2,1),(3,6,2)$. 3

8. a) Find a basis and determine the dimension of the following subspace S of the vector space $\mathbb{R}_{2\times2}$, where $S=\left\{\begin{pmatrix}a & b\\ c & d\end{pmatrix}\in\mathbb{R}_{2\times2} : a+b=0\right\}$. 3

   b) $T:\mathbb{R}^2\to\mathbb{R}^3$ defined by $T(a_1,a_2)=(a_1+a_2,0,2a_1-a_2)$. Examine whether T is a linear transformation or not . 2

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