RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2018-21]

B.A./B.Sc. FIRST SEMESTER (July – December) 2018

Mid-Semester Examination, September 2018

Date : 27/09/2018 **MATH FOR INDUSTRIAL CHEMISTRY (General)**

Time : 12 noon – 1pm Paper: I Full Marks : 25

[Use a separate Answer Book for each group]

Group – A

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

1. Find the values of $(1+i)^{\frac{1}{5}}$. 5

2. If the equation $x^4+ax^3+bx^2+cx+d=0$ has three equal roots, then show that each of them is equal to $\frac{6c-ab}{3a^2-8b}$. 5

3. Prove without expanding that 5

$$\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(a+b)(b+c)(c+a)$$

4. If $A=\begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, then find A^2 and show that $A^2=A^{-1}$. 5

5. Find the characteristic equation and eigen values of the matrix $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. 5

Group – B

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

6. a) If the geometric mean of n_1 values of a variable x be g_1 and that of another n_2 values be g_2, then find the geometric mean of the combined data in terms of g_1 & g_2.

   b) A variable assumes the values 1, 2, ..., 7 with frequencies 1^2, 2^2, …,7^2 respectively. Calculate the mean of the variable. 2+3

7. Suppose two groups of values of a variable x are given. If $\bar{x}_1$ and s_1 respectively denote the mean and standard deviation of n_1 values contained in one group and $\bar{x}_2$ and s_2, the mean and

standard deviation of n_2 values of the other group, then the standard deviation of the combined group is given by $s^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2} + \frac{n_1 n_2 \left(\bar{x}_1 - \bar{x}_2\right)^2}{\left(n_1 + n_2\right)^2}$. 5

8. a) The frequency distribution of a continuous variable after change of origin, is represented below:

u (variable):	–30	–20	–10	0	10	20	30
f (frequency):	2	4	8	27	18	15	6

If the mean of the original frequency distribution is 60, find the original frequency distribution.

b) If the relation between two variables x and y is $xy = 2$, find the relation between harmonic mean of x and arithmetic mean of y. 3+2

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