## Unit IV

No. of Printed Pages: 04
Roll No.
7. If $u=x^{y}$ show that :

$$
\frac{\partial^{3} u}{\partial x^{2} \partial y}=\frac{\partial^{3} u}{\partial x \partial y \partial x}
$$

8. (a) The equation of a line is $3 x-4 y+10=0$. Find its :
(i) Slope
(ii) $x$ - and $y$-intercept.
(b) Solve the following differential equation : 7

$$
x p+y q=3 z
$$

9. Solve the differential equation :

$$
x^{2}(y-z) p+y^{2}(z-x) q=z^{2}(x-y) .
$$

AA-294

## M. Sc. EXAMINATION, May 2017

(First Semester)
(Re-appear Only)
CH-507-B
CHEMISTRY
Mathematics for Chemists

Time : 3 Hours] [Maximum Marks : 70
Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt Five questions in all, selecting at least one question from each Unit. All questions carry equal marks.
P.T.O.

## Unit I

1. (a) If $\vec{r}=a \cos t \hat{i}+a \sin \hat{j}+\hat{k}$, then find the value of $\frac{d r}{d t}, \frac{d^{2} r}{d^{2} t}$.
(b) Show that the vectors $\overrightarrow{\mathrm{P}}=2 a-b+3 c$, $\overrightarrow{\mathrm{Q}}=a+b-2 c, \quad \overrightarrow{\mathrm{R}}=a+b-3 c \quad$ are coplanar or not? 7
2. (a) Show that: 7

$$
\left|\begin{array}{ll}
a d+b c & b d-a c \\
a c-b d & a d+b c
\end{array}\right|=\left(a^{2}+b^{2}\right)\left(c^{2}+d^{2}\right)
$$

(b) Prove which one is larger :

$$
\left(1.01^{1000000}\right) \text { or } 10,000
$$

3. If $A=\left[\begin{array}{ccc}2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2\end{array}\right]$ then verify
$A^{3}-6 A^{2}+9 A-4 I=0$. And hence find $\mathrm{A}^{-1}$.

## Unit II

4. (a) Differentiate w.r.t. $x$ : 7

$$
(\sqrt{x+1}+\sqrt{x-1}) \div(\sqrt{x+1}-\sqrt{x-1})
$$

(b) Find $\frac{d y}{d x}$ :

$$
\text { when } x^{4}+y^{4}+4 x y-100=0 . \quad 7
$$

5. Evaluate the following :
(a) $\int \frac{x^{2}-2}{\sqrt{x}} d x$
(b) $\int x \log (1+x) d x$.
6. (a) If $x y=4$ then show that:

$$
x\left(\frac{d y}{d x}+y^{2}\right)=3 y
$$

(b) Evaluate $\int \frac{x^{2}+2 x+8}{(x-1)(x-2)} d x$.

