Roll No. $\square$
Total No. of Questions: 09

# M.Sc.(Chemistry) (2015 to 2017) (Sem.-1) MATHEMATICS IN CHEMISTRY <br> Subject Code : MSCH-103 <br> M.Code : 72262 

Time : 3 Hrs.
Max. Marks : 100

## INSTRUCTIONS TO CANDIDATES :

1. Attempt FIVE questions in ALL including Question no. 1 which is COMPULSORY and selecting ONE EACH from Unit I to IV.
2. All questions carry EQUAL marks.
3. Write briefly :
a) Give the drawback of Gauss elimination method.
b) Give Newton's backward difference formula.
c) Evaluate the first approximation from $\frac{d y}{d x}=x^{2} y-1, y(0)=1$ using Picard's method.
d) Using Euler's method, find an approximate value of $y(0.2)$ from $\frac{d y}{d x}=x+y, y(0.1)=1.22$.
e) Classify the following PDE $x^{2} \frac{\partial^{2} u}{\partial x^{2}}+\left(1-y^{2}\right) \frac{\partial^{2} u}{\partial y^{2}}=0$.
f) Give regression line $x$ on $y$ and $y$ on $x$.
g) Give four properties of normal distribution.
h) Define null hypothesis by giving suitable example.
i) Give four properties of $F$ distribution.
j) Give four properties of $\chi^{2}$ distribution.

## UNIT-I

2. a) Solve using Gauss elimination method

$$
\begin{aligned}
& 2 x+2 y+z=12 \\
& 3 x+2 y+2 z=8 \\
& 5 x+10 y-8 z=10 .
\end{aligned}
$$

b) Solve by Jacobi's method $20 x+y-2 z=17,3 x+20 y-z=-18,2 x-3 y+20 z=25$.
3. a) Find $\frac{d y}{d x}$ at $x=1.6$ and $\frac{d^{2} y}{d x^{2}}$ at $x=1.1$ from the following data:

| $\boldsymbol{x}$ | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\boldsymbol{y}$ | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

b) Evaluate $\int_{0}^{6} \frac{1}{1+x^{2}} d x$ using Simpson's $1 / 3$ rule.

## UNIT-II

4. a) Using Taylor's series method, find value of $y(0.2)$ from $\frac{d y}{d x}=2 y+3 e^{x}, y(0)=0$
b) Using modified Euler's method, find value of $y(0.3)$ from $\frac{d y}{d x}=\sqrt{x+y}, y(0)=1$.
5. Using Runge-Kutta method, find value of $y(0.2)$ and $y(0.4)$ from $\frac{d y}{d x}=\frac{y-x}{y+x}, y(0)=1$.

## UNIT-III

6. a) Calculate the coefficient of correlation from the following data :

| $\boldsymbol{x}$ | 105 | 104 | 102 | 101 | 100 | 99 | 98 | 96 | 93 | 92 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\boldsymbol{y}$ | 101 | 103 | 100 | 98 | 95 | 96 | 104 | 92 | 97 | 94 |

b) A has one share in a lottery in which there is 1 prize and 2 blanks; B has three shares in a lottery in which there are 3 prizes and 6 blanks. Compare the probability of A's success to that of B's success.
7. a) In sampling a large number of parts manufactured by a machine, the mean number of defective in a sample of 20 is 2 . Out of 1000 such samples, how many would be expected to contain at least 3 defective parts.
b) Fit a Poisson distribution to the data:

| $\boldsymbol{x}$ | 0 | 1 | 2 | 3 | 4 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $\boldsymbol{f}$ | 122 | 60 | 15 | 2 | 1 |

## UNIT - IV

8. a) A die was thrown 9000 times and a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, do the data indicate an unbiased die? (take $z_{0.05}=1.96$ )
b) A sample height of 6400 soldiers has a mean of 67.85 inches and a standard deviation of 2.56 inches while a simple sample of heights of 1600 sailors has a mean of 68.55 inches and a standard deviation of 2.52 inches. Do the data indicate that the sailors are on the average taller than soldiers? (take $z_{0.05}=1.96$ )
9. a) The nine items of a sample have the following values $45,47,50,52,48,47,49,53$, 51. Does the mean of these differ significantly from the assumed mean of 47.5 ? (for $v=8, t_{0.05}=2.31$ )
b) A set of five similar coins is tossed 320 times and the result is :

| No. of heads | 0 | 1 | 2 | 3 | 4 | 5 |
| :--- | ---: | :--- | :--- | :--- | :--- | :--- |
| Frequency | 6 | 27 | 72 | 112 | 71 | 32 |

Test the hypothesis that the data follows a Binomial distribution.

$$
\left(\text { for } v=5, \chi_{0.05}^{2}\right.
$$

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

