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Total No. of Pages : 03

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M.Sc.(Chemistry) (2015 to 2017) (Sem.–1)

MATHEMATICS IN CHEMISTRY

Subject Code : MSCH-103

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.**

1. Write briefly :

a) Give the drawback of Gauss elimination method.

b) Give Newton's backward difference formula.

c) Evaluate the first approximation from $\frac{dy}{dx} = x^2y - 1,\ y(0) = 1$ using Picard's method.

d) Using Euler's method, find an approximate value of $y(0.2)$ from $\frac{dy}{dx} = x + y, y(0.1) = 1.22$.

e) Classify the following PDE $x^2\frac{\partial^2 u}{\partial x^2} + (1 - y^2)\frac{\partial^2 u}{\partial y^2} = 0$.

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 χ^2 distribution.

UNIT-I

2. a) Solve using Gauss elimination method

$2x + 2y + z = 12$

$3x + 2y + 2z = 8,$

$5x + 10y - 8z = 10.$

b) Solve by Jacobi's method $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$.

3. a) Find $\frac{dy}{dx}$ at $x = 1.6$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$ from the following data :

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

b) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using Simpson's 1/3 rule.

UNIT–II

4. a) Using Taylor's series method, find value of y (0.2) from $\frac{dy}{dx} = 2y + 3e^x, y(0) = 0$

b) Using modified Euler's method, find value of y (0.3) from $\frac{dy}{dx} = \sqrt{x+y}, y(0) = 1$.

5. Using Runge-Kutta method, find value of y (0.2) and y (0.4) from $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$.

UNIT-III

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

x	105	104	102	101	100	99	98	96	93	92
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:

x	0	1	2	3	4
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.

(for $v = 5, \chi^2_{0.05}$ 11.07)

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.