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Total No. of Pages : 03

Total No. of Questions : 09

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

MATHEMATICS IN CHEMISTRY

Subject Code : MSCH-103

Paper ID : [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) What are equally likely events? Give an example.
- (b) Criticize the following statement: The mean of a Poisson distribution is 5 while standard deviation is 4.
- (c) Compute the mode of Binomial distribution with $p = 1/2$ and $n = 7$.
- (d) Under what conditions Normal distribution is limiting form of binomial distribution?
- (e) What is 'F' test?
- (f) Define positive correlation.
- (g) What do you mean by iteration method of solving linear equations?
- (h) What is the finite difference form of $\frac{\partial^2 u}{\partial x^2}$?
- (i) Write the disadvantage of Picard method.
- (j) Which of the following method is better Runge-Kutta method or Taylor's series method? Justify

UNIT-I

2. (a) Apply Gauss elimination method to solve the equations

$$2x + y - z = 10$$

$$3x + 2y + 3z = 18$$

$$x + 4y + 9z = 16$$

- (b) Solve, by Jacobi's iteration method, the equations

$$20x - y - 2z = 10$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

3. (a) Solve the following equations by Gauss-Seidel method :

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$2x + 2y + 10z = 14$$

- (b) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson 1/3rd rule. Compare the error with exact value.

UNIT-II

4. (a) Find the value of y for $x = 0.1$ by Picard's method, given that $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$.

- (b) Given that $\frac{dy}{dx} = 2 + \sqrt{xy}$ and $y = 1$ when $x = 1$. Find an approximate value of y at $x = 2$ in steps of 0.2, using modified Euler's method.

5. (a) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{x^2 + y^2}$ with $y(0) = 1$ at $x = 0.2, 0.4$.

- (b) Solve $y' = y^2 + x$, $y(0) = 1$ using Taylor's series method and compute $y(0.1)$ and $y(0.2)$.

UNIT-III

6. (a) A speaks truth in 60 % cases and B in 70 % cases. In what percentage of cases are they likely to contradict each other in stating the same fact?
- (b) Two independent variates x_1 and x_2 have means 5 and 10 and variances 4 and 9 respectively. Obtain the correlation coefficient between $y_1 = 3x_1 + 4x_2$ and $y_2 = 3x_1 - x_2$.
7. (a) What is Poisson distribution? If X follows the Poisson distribution law such that $P(X = 1) = P(X = 2)$, find $P(X = 4)$.
- (b) For a binomial distribution, the mean is 6 and standard deviation is $\sqrt{2}$. Write out all the terms of the distribution.

UNIT-IV

8. (a) What is Student's T test? What are its applications?
- (b) What are the conditions for applying chi square test? The theory predicts the proportion of beans in the four groups A, B, C, and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? (chi square for 3 d.f at 5% level = 7.185).
9. (a) Explain the following (i) Null hypothesis (ii) Test of Goodness of fit.
- (b) Two samples of size 9 and 8 give the sum of squares of deviations from their respective means equal to 160 inches square and 91 inches square respectively. Can they be regarded as drawn from the two normal populations with same variance?