(Pages : 4) **K – 2407**

Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Mathematics

Complementary Course for Chemistry & Polymer Chemistry

Mathematics – III

MM 1331.2 : LINEAR ALGEBRA, PROBABILITY THEORY & NUMERICAL METHODS

(2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the first **ten** questions are compulsory.

They carry **1** mark each.

1. Define null matrix.

2. When do we say that a linear system is homogeneous?

3. Define eigen value of a matrix.

4. State any of the axioms of probability of an event A.

5. Define probability of an event.

6. When do we say that a random variable is continuous?

P.T.O.

7. Write the probability function of Poisson distribution.

8. What is a transcendental equation?

9. Give an example of an algebraic equation.

10. State Simpon's rule.

SECTION – II

Answer **any eight** questions from among the questions 11 to 22.

These questions carry **2** marks each.

11. Find the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \end{bmatrix}$.

12. Prove that the rank of a matrix is same as that of its transpose.

13. Find the characteristic polynomial of $\begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 1 \\ 2 & 1 & 1 \end{bmatrix}$.

14. Show that the eigen values of a diagonal matrix are the same as its diagonal elements.

15. What is the probability that a single card drawn from a pack of 52 cards is red in colour?

16. What is the probability that there are 53 Sundays in a non-leap year?

17. Find the coefficient of x^6 in the binomial expansion of $(1+x)^{10}$.

18. What is the probability of obtaining at most two 6's while throwing a fair die 4 times?

19. If $P(A) = 0.1$ and $P(B) = 0.5$ where A and B are independent events, find $P(A \cup B)$.

20. Write a note on binary chopping.

21. Let $f(x) = x^2 - 6$ and $P_0 = 1$. Find P_2 using Newton's method.

22. Use trapezoidal rule to approximate $\int_0^1 x^3 dx$.

SECTION – III

Answer **any six** questions from among the questions 23 to 31.

These questions carry **4** marks each.

23. Reduce to row equivalent form and find the rank of $\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ -1 & -2 & 6 & -7 \end{bmatrix}$.

24. Using Cramer's rule solve $x + z = -1, -2x + y = 1, -y + z = 5$.

25. Prove that the determinant of an orthogonal matrix is either 1 or –1. Also prove that its eigen values are real or complex conjugates in pairs and have absolute value –1.

26. A club contains 30 members – 20 male and 10 female. In how many ways can a committee of 3 with at least 1 women be selected?

27. What is the probability that a number n, $1 \le n \le 99$, is divisible by

(a) both 4 and 6

(b) by either 4 or 6, but not both.

28. Find the number r such that the area under the normal distribution curve $y = f(x)$ from $\mu - r$ to $\mu + r$ is $\frac{1}{2}$.

29. Obtain an approximate solution of the following equations.

$4x+6y+8z=0,\ 6x+34y+52z=-160,\ 8x+52y+129z=-452.$

30. Write a short note on Gauss-Seidel iteration.

31. Using Simpson's rule with $h = 1$, evaluate $\int_0^2 \frac{1}{4}\pi x^4 \cos\frac{\pi x}{4} dx$.

SECTION – IV

Answer **any two** questions from among the questions 32 to 35.

These questions carry **15** marks each.

32. Find the eigen values and the corresponding eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

33. A and B throw a pair of dice alternately. A wins the game if he gets a total of 6 and B wins if she gets a total of 7. If A starts the game, find the probability of winning the game by A in third throw of the pair of dice.

34. Using Runge-Kutta method solve the initial value problem $y'=x+y,\ y(0)$ with $h=0.2$.

35. Diagonalize the matrix $\begin{bmatrix} 5 & 10 & -10 \\ 10 & 5 & -20 \\ 5 & -5 & 10 \end{bmatrix}$.