

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, October 2019

First Degree Programme under CBCSS

Complementary Course for Chemistry And Polymer Chemistry

MM 1331.2 : MATHEMATICS III — LINEAR ALGEBRA, PROBABILITY
THEORY AND 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 singular matrix.
2. What are equivalent matrices?
3. Define Hermitian matrix.
4. Define sample space.
5. For any mutually exclusive events A and B , $P(A \cup B) = \underline{\hspace{2cm}}$.
6. What is a random variable?
7. Write the probability function of Binomial distribution.
8. What is an algebraic equation?

9. Give an example of a transcendental equation.
10. State trapezoidal rule.

SECTION – II

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

These questions carry 2 marks each.

11. What are elementary transformations?

12. Using definition, find the rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 2 & 2 \end{bmatrix}$.

13. Find the eigen values of $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{bmatrix}$.

14. Prove that the eigen values of a matrix is same as the eigen values of its transpose.
15. If $P(A) = 0.2$ and $P(B) = 0.6$ where A and B are independent events, find $P(A \cup B)$.
16. A bag contains 4 white balls and 5 black balls. A man draws 3 balls at random. What is the probability that all are black.
17. Find the coefficient of x^8 in the binomial expansion of $(1+x)^{10}$.
18. What is the probability of obtaining at least two 6's while throwing a fair die 4 times?
19. What is the probability that there are exactly 52 Sundays in a leap year?
20. What is binary chopping?

21. Using Newton's method find P_2 , where $f(x) = x^2 - 6$ and $P_0 = 2$.

22. Use trapezoidal rule to approximate $\int_0^2 x^2 dx$.

SECTION – III

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

These questions carry 4 marks each.

23. Reduce to normal form and find the rank of $A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$.
24. Using Cramer's rule solve $2x - y + 3z = 9$, $x + y + z = 6$, $x - y + z = 2$.
25. Prove that the eigen values of a Hermitian matrix are real where as that of skew-Hermitian matrix are purely imaginary or zero.
26. A club contains 25 members – 15 male and 10 female. In how many ways can a committee of 3 with at least 2 men be selected?
27. What is the probability that a two digit number 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.
 $9x + 6y + 12z = 17.4$, $6x + 13y + 11z = 23.6$, $12x + 11y + 26z = 30.8$
30. Write a short note on Monte-Carlo method.
31. Evaluate $\int_0^1 e^{-x^2} dx$ using Simpson's rule.

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

$$\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}.$$

33. A and B throw alternately a pair of dice. A wins if he throws 6 before B throws 7 and B wins if she throws 7 before A throws 6. If A begins, his chance of winning would be:

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

35. Diagonalize the matrix $\begin{bmatrix} 16 & 0 & 0 \\ 48 & -8 & 0 \\ 84 & -24 & 4 \end{bmatrix}$
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