

D 113433

(Pages : 3)

Name.....

Reg. No.....

**FIRST SEMESTER (CUFYUGP) DEGREE EXAMINATION
NOVEMBER 2024**

Mathematics

MAT 1FM 105(1)—MATRICES AND BASICS OF PROBABILITY THEORY

(2024 Admission onwards)

Time : One Hour and a Half

Maximum Marks : 50

Section A

All questions can be answered.

Each question carries 2 marks.

(ceiling 16 marks)

1. If $A = \begin{pmatrix} 3 & 2 \\ 7 & 8 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 6 \\ 3 & 3 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & 6 \\ 6 & 2 \end{pmatrix}$, then show that $A \times (B + C) = A \times B + A \times C$.

2. If $A = \begin{pmatrix} 2 & 4 \\ 7 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 6 \\ 9 & 3 \end{pmatrix}$, then show that $|AB| = |A| |B|$.

3. Find the value of x such that $\begin{vmatrix} x-1 & 2 \\ 3 & 4 \end{vmatrix} = 0$.

4. Solve the following linear equations :

$$\begin{aligned} x + 3y &= 5 \\ 5x - y &= 9. \end{aligned}$$

5. Explain the term class width.

6. The weights for a sample of adults before starting a weight loss study are given by 274, 235, 223, 268, 290, 285 and 235. What is the median of weight of the adults ?

7. Find variance and standard deviation of the following data :

21	32	35	43	28
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8. A laptop has 3 choices for a processor, 3 choices for a graphics card, 4 choices for memory, 6 choices for a hard drive, and 2 choices for a battery. How many ways can you customize the laptop ?

Turn over

9. Two cards are selected, without replacing the first card, from a standard deck of 52 playing cards. Find the probability of selecting a king and then selecting a queen.
10. A die is rolled. Find the probability of rolling a 6 or an odd number.

Section B

*All questions can be answered.
Each question carries 6 marks.
(ceiling 24 marks)*

11. Find the inverse of $\begin{pmatrix} 4 & -7 & 6 \\ -2 & 4 & 0 \\ 5 & 7 & -4 \end{pmatrix}$.

12. Find a solution to the given system using Cramer's Rule :

$$\begin{aligned} x + y + z &= 4 \\ 3x - 2y + z &= 3 \\ x + 3y - 2z &= 0 \end{aligned}$$

13. The number of days 20 patients remained hospitalized are given by 6, 9, 7, 14, 4, 5, 6, 8, 4, 11, 10, 6, 8, 6, 5, 7, 6, 6, 3 and 11. Construct a frequency distribution and a frequency histogram for the data set with 5 number of classes.
14. Find the range, mean, variance and standard deviation of the following data :

173	175	200	173	160	185	195	230	190	180
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15. The probability that a particular rotator cuff surgery is successful is 0.9.
- (a) Find the probability that three rotator cuff surgeries are successful.
- (b) Find the probability that none of the three rotator cuff surgeries are successful.
- (c) Find the probability that atleast one of the three rotator cuff surgeries are successful.

Section C

*Answer any **one** question.
The question carries 10 marks.*

16. Solve the system of linear equations by Gaussian elimination method :

$$\begin{aligned} 2x + y - 2z &= 6 \\ 3x - 4y + z &= 2 \\ x - 5y - z &= -8 \end{aligned}$$

17. (a) Of the cartons produced by a company, 5 % have a puncture, 8 % have a smashed corner, and 0.4 % have both a puncture and a smashed corner. Find the probability that a randomly selected carton has a puncture or has a smashed corner.
- (b) Find the number of ways of forming four-digit codes in which no digit is repeated.
- (1 × 10 = 10 marks)