SECTION – D

Answer **any 2** questions out of **4** questions. **Each** question carries **6** marks.

27. Using Gauss Jordan method, find the complete solution set for the system of linear equations : $-2x + y + 8z = 0$, $7x - 2y - 22z = 0$, $3x - y - 10z = 0$. Also express the solution set as linear combination of particular solutions.

28. Diagonalize the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

29. If $f(x, y) = \begin{cases} 2 - x - y, & 0 \le x \le 1, \ 0 \le y \le 1 \\ 0, & \text{elsewhere} \end{cases}$

    find marginal probability functions and conditional probability functions.

30. State and prove Chebyshev's inequality. $\qquad$ (2×6=12)

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Reg. No. : ....

Name : ....

I Semester B.Sc. Hon's (Mathematics) Degree (Regular/Supple./Improv.)
Examination, November 2017
(2016 Admission)
BHM 104 : MATRICES AND PROBABILITY THEORY

Time : 3 Hours $\hspace{5cm}$ Max. Marks : 60

SECTION – A

Answer **any four** questions out of **5** questions. **Each** question carries **1** mark.

1. Give an example for a unit vector.

2. What is the determinant of the matrix $\begin{bmatrix} 1 & -3 \\ -2 & 3 \end{bmatrix}$?

3. What do you mean by discrete random variables ?

4. Define expectation of a continuous random variable.

5. What is the value of covariance of two independent random variables ? $\qquad$ (4×1=4)

SECTION – B

Answer **any 6** questions out of **9** questions. **Each** question carries **2** marks.

6. What do you mean by orthogonal vectors ? Check whether the vectors, if $x = [2, 5]$ and $y = [-10, 4]$ are orthogonal or not.

7. What do you mean by reduced row echelon form of a matrix ?

8. What do you mean by row space of a matrix ? Check whether $[3, 5]$ is in the row space of $\begin{bmatrix} 2 & -4 \\ -1 & 2 \end{bmatrix}$ or not ?

P.T.O.

9. Find any four minors of the matrix $A = \begin{bmatrix} 5 & -2 & 1 \\ 0 & 4 & -3 \\ 2 & -7 & 6 \end{bmatrix}$.

10. Define characteristic polynomial of a square matrix. Find the characteristic

polynomial of the matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$.

11. What do you mean by cumulative probability distribution function ? What are the values of $F(\infty)$ and $F(-\infty)$ if $F(x)$ is the cumulative probability distribution of a random variable x ?

12. Find the mean of the random variable with probability density function $f(x) = ae^{-|x|}$, $-\infty \le x \le \infty$.

13. If the Chebyshev's inequality for the random variable X is given by $P(-2 < X < 8) \ge \dfrac{21}{25}$, find E (X) and Var (X).

14. Write a note on kurtosis. 　　　　　　　　　　　　　　　(6×2=12)

SECTION – C

Answer **any 8** questions out of **12** questions. **Each** question carries **4** marks.

15. Using Gauss elimination method, solve the system of linear equations :

    $2x + y + 3z = 16$, $3x + 2y + w = 16$, $2x + 12z - 5w = 5$.

16. Suppose that A and B are row equivalent matrices. Prove that row space of A equals the row space of B.

17. Using row reduction method, find the inverse of the matrix $\begin{bmatrix} 2 & -2 & 3 \\ 8 & -4 & 9 \\ -4 & 6 & -9 \end{bmatrix}$.

18. Prove that for an upper triangular matrix, the determinant is the product of the main diagonal elements.

19. Briefly explain the method for diagonalizing an n×n matrix.

20. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$

21. A random variable X has the following probability distribution.

X :	0	1	2	3	4
P(X) :	2k	3k	k	2k	6k

Find

i) k, 　　　　　　　ii) P (0 < x < 2) 　　　iii) P (x > 2).

22. If $F(x, y) = 4xye^{-(x^2+y^2)}$, $x \ge 0$, $y \ge 0$, is the joint distribution of X and Y, show that X and Y are independent.

23. If X and Y are two discrete random variables, prove that

    i) $E(X + Y) = E(X) + E(Y)$ and

    ii) $E(XY) = E(X) E(Y)$ if X and Y are independent.

24. The first four central moments of a distribution are 0, 2.5, 0.7 and 18.75. Test the skewness and kurtosis of the distribution.

25. Find the first four moments of the data : 4, 5, 6, 1, 4 about mean.

26. A random variable X assumes the values $\dfrac{1}{2}$ and $\dfrac{1}{2}$ with probability $\dfrac{1}{2}$ each. Find the moment generating function and four moments about the origin. 　　　(8×4=32)