B.Sc. DEGREE EXAMINATION,NOVEMBER 2018
I Year I Semester
Core Major-Paper II
PROBABILITY AND RANDOM VARIABLES

Time : 3 Hours **Max.marks :60**

Section A $(10 \times 1 = 10)$ Marks

Answer any **TEN** questions

1. Define a sample space.
2. Write the axioms of probability.
3. State Bayes' theorem in probability.
4. If two dice are thrown, what is the probability that the sum is greater than 6?
5. State any two properties of distribution function.
6. What is stochastic independence?
7. If X is a random variable then find V(aX+b) where a and b are constants.
8. Define conditional expectation.
9. Define characteristic function.
10. State the central limit theorem in probability.
11. Give any one drawback of classical approach to probability.
12. Let X be a random variable with the following probability distribution

x:	-3	6	9
P(x) :	1/6	1/2	1/3

Find the mean of the random variable X

Section B $(5 \times 4 = 20)$ Marks

Answer any **FIVE** questions

13. An MBA applies for a job in two firms X and Y. The probability of him being selected in firm X is 0.7 and being rejected in firm Y is 0.5. The probability of atleast one of his applications being rejected is 0.6. What is the probability that he will be selected in one of the firms?
14. State and prove multiplication theorem of probability for two events.
15. A random variable X has the following probability function.

x :	0	1	2	3	4	5	6	7
P(x) :	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

i. Find the value of k

ii. Evaluate P(0<X<5)

iii. If P(X=a)>1/2.Find the minimum value of a

16. If X and Y are random variables then show that E(X+Y)=E(X)+E(Y)
17. State and prove the uniqueness theorem of characteristic function
18. For any two events A and B show that

    (i) P($\overline{A} \cap B$)=P(B)-P($A \cap B$)

    (ii) P($A \cap \overline{B}$)= P(A)- P($A \cap B$)

19. If A and B are independent events then show that (i) A and $\overline{B}$ (ii) $\overline{A}$ and $\overline{B}$ are also independent

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. State and prove Boole's inequality.
21. The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X died. What is the chance that his disease was diagnosed correctly?
22. Two random variables X and Y have the following joint probability density function $f(x, y) = \begin{cases} 2 - x - y, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0\ , & otherwise \end{cases}$
    Find

    (i) Marginal probability density functions of X and Y

    (ii) Conditional density functions

    (iii) Var(X) and Var(Y)

23. State and prove Chebyshev's inequality.
24. State and prove the properties of moment generating function.

B.Sc. DEGREE EXAMINATION,NOVEMBER 2018
I Year I Semester
Core Major-Paper II
PROBABILITY AND RANDOM VARIABLES

Time : 3 Hours **Max.marks :60**

Section A $(10 \times 1 = 10)$ Marks

Answer any **TEN** questions

1. Define a sample space.
2. Write the axioms of probability.
3. State Bayes' theorem in probability.
4. If two dice are thrown, what is the probability that the sum is greater than 6?
5. State any two properties of distribution function.
6. What is stochastic independence?
7. If X is a random variable then find V(aX+b) where a and b are constants.
8. Define conditional expectation.
9. Define characteristic function.
10. State the central limit theorem in probability.
11. Give any one drawback of classical approach to probability.
12. Let X be a random variable with the following probability distribution

x:	-3	6	9
P(x) :	1/6	1/2	1/3

Find the mean of the random variable X

Section B $(5 \times 4 = 20)$ Marks

Answer any **FIVE** questions

13. An MBA applies for a job in two firms X and Y. The probability of him being selected in firm X is 0.7 and being rejected in firm Y is 0.5. The probability of atleast one of his applications being rejected is 0.6. What is the probability that he will be selected in one of the firms?
14. State and prove multiplication theorem of probability for two events.
15. A random variable X has the following probability function.

x :	0	1	2	3	4	5	6	7
P(x) :	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2$+k

i. Find the value of k

ii. Evaluate P(0<X<5)

iii. If P(X=a)>1/2.Find the minimum value of a

16. If X and Y are random variables then show that E(X+Y)=E(X)+E(Y)
17. State and prove the uniqueness theorem of characteristic function
18. For any two events A and B show that

    (i) P($\overline{A} \cap B$)=P(B)-P($A \cap B$)

    (ii) P($A \cap \overline{B}$)= P(A)- P($A \cap B$)

19. If A and B are independent events then show that (i) A and $\overline{B}$ (ii) $\overline{A}$ and $\overline{B}$ are also independent

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. State and prove Boole's inequality.
21. The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X died. What is the chance that his disease was diagnosed correctly?
22. Two random variables X and Y have the following joint probability density function $f(x, y) = \begin{cases} 2 - x - y, & 0 \le x \le 1, 0 \le y \le 1 \\ 0 \ , & otherwise \end{cases}$

    Find

    (i) Marginal probability density functions of X and Y

    (ii) Conditional density functions

    (iii) Var(X) and Var(Y)

23. State and prove Chebyshev's inequality.
24. State and prove the properties of moment generating function.