**B.Sc. DEGREE EXAMINATION, APRIL 2016.**

**I YEAR — I SEMESTER**

**Major Paper II — PROBABILITY AND RANDOM VARIABLES**

**Time : 3 hours Max. Marks : 60**

**SECTION A — (10 × 1 = 10 marks)**

**Answer any *TEN* questions**

1. State the axiomatic definition of probability.
2. What is a random experiment?
3. Define sample space with an example.
4. Let random variable X have pdf $f\left(x\right)=2x, 0\leq x\leq 1,$ Find E[X].
5. What do you mean by stochastic independence?
6. State the central limit theorem.
7. Define characteristic function.
8. State the multiplication theorem of expectations.
9. What is the use of Chebyshev’s inequauality?
10. State the Uniqueness theorem of characteristic function.
11. Define marginal density function of X and Y.
12. Find E(X), if the characteristic function of the random variable X is $\left(q+pe^{it}\right)^{n}$.

**SECTION B — (5 × 4 = 20 marks)**

**Answer any *FIVE* questions**

1. State and prove Baye’s theorem.
2. State and prove any two properties of the distribution function.
3. Daily demand for transistors is having the following probability distribution:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Demand : | 1 | 2 | 3 | 4 | 5 | 6 |
| Probability : | 0.10 | 0.15 | 0.20 | 0.25 | 0.18 | 0.12 |

Determine the expected daily demand for transistors. Also obtain the variance of the demand.

16. Prove that if $A$ and $B$ are independent events then $A$ and $B^{c} $and $A^{c}$ and $B^{c}$ are also independent.

17. A speaks the truth 2 out of 3 times and B 4 out of 5 times. They agree that from a bag 6 balls of different colours, a black ball has been drawn. Find the probability that the statement is true.

18.Define moment generating function and prove that $M\_{x\_{1+ X\_{2}}}\left(t\right)= M\_{x\_{1}}\left(t\right)\* M\_{x\_{2}}\left(t\right)., $ if $X\_{1}$ and $X\_{2}$ are two independent random variables.

1. Prove that $V\left(X\right)=E\left[V\left(^{X}/\_{Y}\right)\right]+ V\left[E\left(^{X}/\_{Y}\right)\right].$

**SECTION C — (3 × 10 = 30 marks)**

**Answer any *THREE* questions**

1. State and prove Boole’s inequality.
2. If $f\left(x\right)= e^{-x}$ for $x\geq 0$

 0 otherwise,

 Find the first four central moments.

1. Let random variables X and Y have joint probability distribution given by $F\left(X,Y\right)=2-X-Y, 0\leq X \leq 1$ and $0 \leq Y \leq 1. $Compute the correlation coefficient between X and Y.
2. State and prove the properties of moment generating function of a random variable.
3. State and prove the multiplication theorem of probability.