K18U 0517

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (C.B.C.S.S. – Reg./Supple./Imp.) Examination, May 2018
CORE COURSE IN STATISTICS
2B02 STA : Probability Theory
(2014 Admn. Onwards)

Time : 3 Hours   Max. Marks : 48

PART – A

Short Answer. Answer **all** the **6** questions. **(6×1=6)**

1. Define conditional probability.
2. Distinguish between discrete and continuous random variables.
3. Define distribution function.
4. State multiplication theorem on expectation.
5. State the relation between second central moment and first and second raw moments.
6. Define cumulant generating function.

PART – B

Short Essay. Answer **any 7** questions. **(7×2=14)**

7. If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$ and $P(AB) = \frac{1}{8}$. Find $P(A|B)$ and $P(A|B^C)$.
8. Explain the concept of statistical regularity.
9. Two random variables X and Y have the joint p.d.f.

   $f(x, y) = k(x^2 + y^2), 0 < x < 2, 1 < y < 4$

   $= 0$, elsewhere. Find k.

P.T.O.

10. If X is a continuous random variable with p.d.f.

$f(X) = 2x, 0 < x < 1$

$= 0$, elsewhere

and $Y = 3X + 1$, then find the p.d.f. of Y.

11. Define conditional expectation. Prove that $E[E(X|Y)] = E(X)$.

12. Give an example to show that pairwise independence does not imply mutual independence.

13. The joint p.d.f. of two random variables (X, Y) is given by

$f(x, y) = 2, 0 < x < y < 1$

$= 0$, elsewhere.

Find the conditional mean of X given Y = y.

14. State any two drawbacks of moment generating function.

15. Define probability generating function.

PART – C

Essay. Answer **any 4** questions. **(4×4=16)**

16. From a vessel containing 3 white and 5 black balls, 4 balls are transferred into an empty vessel. From this vessel a ball is drawn and is found to be white. What is the probability that out of four balls transferred, 3 are white and 1 black.

17. X and Y are two random variables having the joint density function, $f(x, y) = \frac{1}{27}(2x + y)$, where x and y can assume only the integer values 0, 1 and 2. Find the conditional distribution of Y for X = x.

18. State and prove Baye's theorem.

19. State and prove any two properties of characteristic function.

20. If X and Y have the joint p.d.f. as follows :

(x, y) :	(0, 0)	(0, 1)	(0, 2)	(1, 0)	(1, 1)	(1, 2)
f(x, y):	1/12	1/6	1/4	1/3	1/12	1/12

Find Cov (X, Y).

21. Find k so that $f(x, y) = kx(y - x), 0 \le x \le 4, 4 \le y \le 8$ will be a bivariate probability density function.

PART – D

Long Essay. Answer **any 2** questions. **(2×6=12)**

22. a) Distinguish between frequency and axiomatic approaches to probability.

b) If two dice are thrown, what is the probability that the sum is :

i) greater than 8 and

ii) neither 7 nor 11 ?

23. If $f(x, y) = k(x + y + xy), 0 < x < 1, 0 < y < 1$.

$= 0$, otherwise

Determine k, the marginal densities and the conditional density of X | Y.

24. If X and Y are two random variables having joint p.d.f.

$f(x, y) = 2 - x - y, 0 < x < 1; 0 < y < 1$

$= 0$, elsewhere . Find correlation coefficient ρ_{xy}.

25. Define conditional variance. Show that variance of a random variable can be written as the sum of the expectation of the conditional variance and the variance of the conditional expectation.

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