M17227 (Pages : 2) Reg. No:..............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Statistics Degree Examination, March 2017

ST2B02 – Bivariate Random Variable & Probability Distribution

(2016 Admission onwards)

. Time: 3 hours Max. Marks : 80

Part A

(Answer **all** questions, each question carries 1 mark)

$E(X - K)^2$ is the variance of X when

(a)K <E(X) (b) K =E(X) (c) K >E(X) (d) $K^2 = E(X)$

E(X .Y) =E(X) E(Y) if

(a)X&Y are independent (b) X&Y are identical

(c) X&Y are dependent (d) none of the above

$F_{x,y}(x,\infty) =$ ....

(a) 1 (b) 0 (c) $F_x(x)$ (d) $F_y(y)$

Correlation coefficient lies in the interval :

(a) (0, 0) (b) (-1, 1) (c) (-1, 0) (d) (0, 1)

A distribution for which mean = variance is:

(a)Poisson (b) Uniform (c) Binomial (d) Exponential

The points of inflexion of the normal curve are:

(a)$\mu \pm \sigma$ (b) $\mu \pm 3\sigma$ (c) $\mu \pm 1$ (d) $\mu \pm 3$

If X and Y are independent then correlation coefficient between X and Y is = ...

If E(X) =4, E(Y) =5 then E (2XY) = ...if X&Y are independent

The mean of a Gamma distribution with parameter m and p is ....

The mean of a Poisson distribution is 3 .Then P(X = 1) =....................

Moment generating function of binomial distribution is $(1/3 + 2/3\, e^t)^5$, find the pmf.

The joint density function of two random variables X and Y is f(x, y) =3xy, $0 \le x \le 1$, $0 \le y \le 3$. Find E(XY)?

(12 x 1 = 12 Marks)

Part B

(Answer any 7 questions, each question carries 2 marks)

Define expectation of bivariate random variables.

Define marginal p.d.f of a r.v

Prove that cov (X,Y) = E (X Y) – E(X) E(Y)

Prove or disprove E (X +Y) = E(X) +E(Y) for any two random variables X and Y

Define log normal distribution

Derive the variance of an exponential distribution

19. If X→N (25, 3) and Y→N (20, 4) and X and Y are independent then find the distribution of X+Y?

20. Define continuous rectangular distribution in the interval (0, 2) and hence obtain its moment generating function?

21. If X and Y are random variables with joint probability density function $f(x, y) = \frac{x+2y}{18}$ where (x, y) = (1, 1) (1, 2) (2, 1) (2, 2) =0 Otherwise, are the variables independent ?

(7 x 2 = 14 Marks)

Part C

(Answer any 6 questions, each question carries 5 marks)

22 Derive Poisson distribution as a limiting form of Binomial distribution.

23. Show that correlation coefficient is a dimensionless measure independent of origin and unit of measure?

24. Obtain the Median of Normal distribution.

25. If X and Y are independent random variables, show that V(X + Y) = V (X – Y).

26. Establish the recurrence relation for moments of a Binomial distribution and find the first four central moments?

27. Find mean, variance and moment generating function of Rectangular distribution over the interval (a, b).

28. Define Geometric distribution and explain the lack of memory property of G.D

29. The joint probability density function of (X, Y) is $f(x, y) = 3xy,\ 0\leq x\leq 1,\ 0\leq y\leq 1$ Find E(Y\X = x)?

(6 x 5 = 30 Marks)

Part D

(Answer any 3 questions , each question carries 8 marks)

30. a) If X and Y are independent Binomial variates obtain the conditional distribution of X given X+Y?
b) Find the r^{th} central moment of normal distribution?

31. The Joint probability density function of (X, Y) is $f(x, y) = \frac{x+y}{21}$ x=1,2,3; y=1,2
Obtain cov(x,y), correlation coefficient &regression functions.

32. a) Define moments. Establish the relation between row moments and central moments?
b) Among a large group of students 5% are under 150cm and 40% are between 150 cm and 162cm in height. Assuming normal distribution , find mean and standard deviation of height?

33. Derive the moment generating function of Poisson distribution and hence obtain the first four central moments of the distribution?

34. a) Define normal distribution and write its properties?
b) Stating the conditions prove that binomial distribution tends to normal distribution.

(3 x 8 = 24 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Statistics Degree Examination, March 2017

ST2C02 –Probability Distribution

(2016 Admission onwards)

. Time: 3 hours Max. Marks : 80

Part A

Answer all questions, each carries one mark

ose the correct answer

. If $f(x_1 y) = \frac{x+y}{21}$, X=1,2,3 ; y = 1, 2 then f(y):

a) $\frac{1+y}{21}$ b) $\frac{2+y}{21}$ c) $\frac{3+y}{21}$ d) $\frac{6+3y}{21}$

. If X is a r.v, then V(2-3x) is

a) 2- Var(3x) b) Var(2)-Var(3x) c) 2-3 Var(x) d) 9 V(x)

. Binomial distribution is negatively skewed when

a) P=0 b) p > 1/2 c) p < 1/2 d) p =1/3

. In a Poisson distribution, if the values of λ is an integer, then the distribution will be

a) unimodal b) bimodal c) trimodal d) none

. The range of beta variate is

a) (-∞, 0) b) (1, ∞) c) (-∞, ∞) d) (0, 1)

. If x~p (λ) and p (x =2) = p(x=3), then the value of λ is

a) 2 b) 3 c) 4 d) 6

he blanks

$E(x\backslash y = 2) = \frac{26}{12}$, $E(x^2\backslash y = 2) = \frac{64}{12}$, then $V(x\backslash y = 2)$ = ____________

If y= 5x + 10 and x is N(10, 25). Then mean of y =____________

The mean of the discrete uniform distribution is ____________

. If C is a constant, then V(C) = ____________

. The 4^{th} central moment of normal distribution is ____________

. The characteristic function is defined as ____________ **(12×1 = 12 Marks)**

Part B

Answer any seven questions, each carries two marks.

13. Define conditional variance of x\y = y
14. Define Karl Pearson's correlation coefficient.
15. Derive the m.g.f of Poisson distribution.
16. Write any four properties of normal distribution
17. If $f(x) = q^{x-1} p$, x = 1, 2 .... Find mean of X.
18. State Chebysheff's inequality.
19. Define Cauchy's distribution.
20. Define convergance in probability.
21. Derive the mean of gamma distribution.

(7×2 = 14 Marks)

Part C

Answer any six questions, each carries five marks.

22. A random variable x has a probability function $f(x) = (\frac{1}{2})^x$, x = 1, 2, 3 ...., find the m.g.f and hence find the mean and mode of X.
23. The joint density function f(x, y) = 2 – x – y, 0 ≤ x ≤ 1, 0 ≤ y ≤ 1 and f (x₁ y) = 0 elsewhere. Obtain the regression function of x on y and y on x.
24. Derive the m.g.f of binomial distribution and hence obtain mean and variance.
25. For a binomial distribution $\beta_1 = \frac{1}{15}$ and $\beta_2 = \frac{89}{30}$, obtain mean and variance.
26. Derive Possion distribution as a limiting case of binomial distribution.
27. Find the mode of the Normal distribution.
28. Define exponential distribution. Obtain the m.g.f and hence find mean and variance.
29. Examine whether the weak law of large numbers holds good for the sequence $\{x_n\}$ of independent r. v where $P[x_n = \frac{1}{\sqrt{n}}] = \frac{2}{3}$, $P[x_n = -\frac{1}{\sqrt{n}}] = \frac{1}{3}$

(6×5 = 30 M

Part D

Answer any three questions, each carries 8 marks.

30. If $P(x, y) = xye^{-(x+y)}$, x ≥ 0, y ≥ 0 find
    i) P (x < 1) ii) P (y < 2) iii) P (x < ½, y < ½) iv) verify the ind
31. For a normal distribution 31% of the items are under 45 and 8% are over 64. Obtain P(45 ≤ x ≤ 55)
32. State and prove Lindberg - Levy form of CLT
33. Prove that
    i) E (x +y) = E (x) + E (y)
    ii) E (xy) = E (x) E(y) if x and y are independent
    iii) E { E (x\y) } = E(x)
34. State and prove Renovsky formula for finding central movements of Binomial Distribution. Hence obtain μ_2, μ_3 and μ_4.

(3×8 = 2

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Second Semester B.Sc Statistics Degree Examination, March 2017

AS2C02 –Life Contingencies

(2016 Admission onwards)

x. Time: 3 hours Max. Marks : 80

PART-A

Answer ***all*** questions. Each question carries ***one*** mark

1. If the survival function S(x) is 1-x, then the distribution function is ....
   a) -x b) 1
   c) x d) 1/x
2. If $S(x) = \frac{120-x}{120}$, $0 \leq x \leq 120$. Calculate $f(x)$.
   a) $\frac{x}{120}$ b) 1
   c) $1 - \frac{x}{120}$ d) 1/120
3. $S_{(+\infty)}$ is equal to
   a) -1 b) F(0)
   c) 0 d) 1
4. If T(x) and K(x) represent the future life time and curtate future life time of life- age-(x), then the event {T(x)=5.6} is equivalent to :
   a) {K(x) = 5} b) {K(x) = 6}
   c) {5≤K(x)<6} d) {5<K(x)≤6}
5. Choose the correct notation for the n- year deferred whole life annuity due.
   a) $n/\ddot{a}_x$ b) n/A_x
   c) $n/\bar{a}_x$ d) $n/\bar{A}_x$
6. The amount either as a lump sum or as a series of payments provided by the insurance company is called ....
7. An Endowment insurance is a combination of .... and ....
8. A .... is a contract to pay a benefit if and when the policy holder is diagnosed as suffering from a particular disease.
9. Total number of years lived beyond age x by the survivors of initial group is denoted by ....
10. Calculate the value of e^0_{65} using AM92 ultimate mortality table.
11. Using CFM assumption, find $_{0.5}P_{70}$
12. A population is subject to a constant force of mortality 0.015. Calculate the probability that a life aged 20 will die before age 22.

(12 x 1= 12Marks)

PART-B

Answer any ***seven*** questions. Each question carries ***two*** marks.

13. Define k/q_{xy}
14. Define future lifetime
15. Prove the identity $\delta\bar{a}_x + \bar{A}_x = 1.$
16. Prove that $\mu(x) = \frac{-1}{l_x}\frac{dl_x}{dx}$
17. If $s(x) = 1 - \frac{x}{100}$, $0 \le x \le 100$, calculate $\mu(x)$
18. Define continuous whole life annuity.
19. Define $_{t/u}q_x$.
20. Prove that $f_{T(x)}(t) = {}_tp_x\, \mu(x+t)$
21. Using the ELT15(males) life table, calculate the probability of 42 year old dying between ages 62 and 75

(7 x 2= 14 Mark

PART-C

Answer any ***six*** questions. Each question carries ***five*** marks.

22. Explain n-year deferred whole life insurance.
23. Write a note on Analytical Laws of Mortality.
24. Prove that $\ddot{a}_{x:n\urcorner} = \sum_{k=0}^{n-1} v^k$
25. Briefly explain present values of joint life and last survivor assurances.
26. Calculate $_{3.25}P_{45.5}$ and $_{6.75}P_{52.5}$ using the UDD assumption (AM92)
27. Prove that $n/\bar{a}_x = {}_nE_x\, \bar{a}_{x+n}$
28. Explain whole life immediate annuity.
29. Explain n-year temporary life annuity due.

(6 x 5= 30 Mar

PART-D

Answer any ***three*** questions. Each question carries ***eight*** marks.

30. Derive the relationship between Insurance payable at the moment of death and the of the year of death.
31. Explain the following :
    a) Present values of joint life and last survivor assurance.
    b) Present values of joint life and last survivor annuities.
32. Derive the commutation function for whole life annuity due, n-year temporary annuit due and n-year deferred annuity due.
33. Explain n-year Endowment Assurance contract. Find its Mean and Variance.
34. Calculate $_3P_{62.5}$ based on the PFA92C20 table in the table using
    i. The UDD assumption.
    ii. The CFM assumption.

(3 x 8= 24 Ma