Mathematical Statistics

Question Bank

Dr Dler Kadir

Exer. (1)

$$f(x_1,x_2)=\begin{cases}4x_1x_2 0<x_1<1\\0<x_2<1\\0 o.w\end{cases}$$

$be the j.p.d.f of x_1 \& x_2.$

$Find:$

$1) p(0<x_1<\frac{1}{2}, \frac{1}{4}<x_2<1)$

$2) p(x_1=x_2)$

$3) p(x_1<x_2)$

$4) p(x_1\le x_2)$

Exer. (2)

$et the pro. set fun. p(A) of two r.v's x \& y be.$

$$p(A)=\sum\sum_A f(x,y), where f(x,y)=\frac{1}{52}, (x,y)\in A$$

$A=\{(x,y);(x,y)=(0,1),(0,2),\dots,(0,13),(1,1),\dots,(1,13),\dots,(3,1),\dots,(3,13)\}$

$compute p(A)=p[(x,y)\in A]$

$a) when A=\{(x,y);(x,y)=(0,4),(1,3),(2,2)\}$

$b) when A=\{(x,y); x+y=4, (x,y)\in A\}$

Exer. (3)

IF $x \& y$ *having the j.p.d.f as;*

$$f(x,y)=\begin{cases}\frac{xy}{96} & 0<x<4 \;,\; 1<y<5\\0 & o.w\end{cases}$$

Find : $f(y)$, $f(x)$

Exer. (4) :let the j.p.d.f of x & y be:

$$f(x,y)=\begin{cases} e^{-x-y} & 0<x<\infty \;,\; 0<y<\infty \\ 0 & o.w \end{cases}$$

Find: 1) $E(x)$, 2) $E(y)$ 3) Exy

Exer. (5) Example(18): let

$$f(x,y) = \begin{cases} 2x0 < x < 1, 0 < y < 1 \\ 0o.w \end{cases}$$

$Compute: E(x+y)E(x+y)^2 - [E(x+y)]^2$

Exer. (6)

$f(x,y) = 20 < x < y, 0 < y < 1$

$= 0o.w$

$Find: 1)Ex2)Ey3)Exy$

Exer. (7) : $letthej.p.d.fofx\&y$

$$f(x,y) = \begin{cases} \frac{1}{4}(x,y) = (0,0),(1,1),(1,-1),(2,0) \\ 0o.w \end{cases}$$

$calculate\; cov(x,y) and \rho_{xy}.$

Exer. (8) : $letx\&yhavethej.p.d.fdiscrete$

(x,y)	$f(x,y)$
$(0,0)$	$(1,6)$
$(1,0)$	$(2,6)$
$(1,1)$	$(2,6)$
$(2,1)$	$(1,6)$

$0 o.w$

$Find or calculate the correlation of coefficient between x \& y$

Exer. (9) Example(26): $let\ x \& y\ are\ two\ r.v's\ have\ the\ j.p.d.f$

$$f(x,y)=\begin{cases}\frac{1}{3} & (x,y)=(0,0),(1,1),(2,2)\\ 0 & o.w\end{cases}$$

$compute\ the\ correlation\ of\ coefficient\ between\ x \& y.$

Exer. (10)

$$f(x,y)=\frac{1}{3}\ (x,y)=(0,0),(1,1),(2,0)$$

$$=0\ o.w$$

$Find: \rho_{xy}.$

Exer. (11)

$$f(x,y)=\frac{1}{3}\ (x,y)=(0,2),(1,1),(2,0)$$

$$=0\ o.w$$

$Find: \rho_{xy}.$

Exer. (12) :let $x \& y$ have the following $j.p.d.f$;

$$f(x,y)=\begin{cases}e^{-y} & 0<x<y<\infty\\ 0 & o.w\end{cases}$$

Find : Ex , Ey , ρ_{xy}

Exer. (13) $x \& y\ be\ two\ r.v's\ with\ j.p.d.f$

$$p(x,y)=\begin{cases}\frac{1}{16} & x,y=1,2,3,4\\ 0 & o.w\end{cases}$$

$show\ that\ x \& y\ are\ stoch.\ indep.$

Exer. (15)

$f(x,y) = 2e^{-x-y} 0 < x < y, 0 < y < \infty$

$= 0 o.w$

$show that x \& y are r.v's independent or not.$

Exer. (16)

$$f(x_1,x_2,x_3) = \begin{cases} \frac{1}{4} (x_1,x_2,x_3) = (0,0,0),(1,0,0),(0,1,0),(0,0,1),(1,1,1) \\ 0 o.w \end{cases}$$

$$let f_{ij}(x_i,x_j) = \frac{1}{4}(x_i,x_j) = [(0,0),(1,0),(0,1),(1,1)]$$

$$f_i(x_i) = \frac{1}{2} x_i = 0,1 i \neq j$$

$show that the r.v's are indep.$

Exer. (17)

Let $x \& y$ be two r.v's , haning j.p.d.f

$$p(x,y) = \begin{cases} \frac{1}{18} & (0,0) \ , \ (2,1) \\ \frac{3}{18} & (0,1) \ , \ (1,1) \\ \frac{4}{18} & (1,0) \\ \frac{6}{18} & (2,0) \\ 0 & o.w \end{cases}$$

1) Are $x \& y$ are indep.
2) Find ρ_{xy} .

Exer. (18)

$\boxed{Example(46)}$: Let

$f(x_1/x_2) = C_1 \frac{x_1}{x_2^2} 0 < x_1 < x_2 < 1$

$= 0 o.w$

And $f(x_2) = C_2 x_2^4 0 < x_2 < 1$

1. the value of $C_1 \& C_2$
2. $f(x_1,x_2)$
3. $p(\frac{1}{4} < x_1 < \frac{1}{2} / x_2 = \frac{5}{8})$
4. $pr(\frac{1}{4} < x_1 < \frac{1}{2})$

$pr(\frac{1}{4} < x_2 < \frac{1}{2})$

Exer. (19) $\boxed{Example(51)}$:let x& y betwo $r.v'swith$

$$f(x/y) = \frac{2x+4y}{1+4y} 0 < x < 1$$

$$0 < y < 1$$

$and f(y) = \frac{1}{2}(1+4y) 0 < y < 1$

Find

1. j. p. d.f of x& y
2. show that f(x/y) is

Exer. (20)):let x& y having the following j.$p.d.f$

f(x,y)=x+y 0<x<1 0<y<1

1. marginal p.d.f of x.
2. marginal p.d.f of y
3. conditional p.d.f of (y/x)
4. $f(y/x = \frac{1}{2})$
5. x& y are stoc .indep?

Exer. (21) :t x& y having the following j.$p.m.f$

$$p(x,y) = \begin{cases} {}^{1}/_{12} \ (1,2)(3,2) \\ {}^{2}/_{12} (2,2)(3,3)(1,3) \\ {}^{4}/_{12} \ (2,4) \end{cases}$$ Find

1. J. c. d. f
2. p(x=2/y=3)
3. p(y/x=2)

Exer. (22)

Example(54) :let x& y having the following j.p.d.f

$$f(x,y)=\frac{e^{-2}}{x!\,(y-x)!}\,x=0,1,\ldots,y\,y=0,1,\ldots..$$

$$=o o.w$$

Find :

1. $them.g.f Mxy(t_1,t_2) of the j.dist.$
2. compute the mean & variance , and the corr. Coff. x&y
3. determine the conditional p.d.f of (x/y).

Exer. (23) f(x,y)=2 0<x<y<1

=0 o.w

Find 1.E(x/y)

2.E(y/x)

3.v(x/y)

4.v(y/x)

Exer. (24) $t the j.p.d.f of x \& y be:$

$$p(x,y)=\begin{cases}\frac{xy^2}{30} x=1,2,3\\ y=1,2\\ 0 o.w\end{cases}$$

$Find: f(x), f(y)?$

Exer. (25) $t x\&y are two r.v's with:$

$$f(x_1,x_2)=\begin{cases}e^{-(x+y)} 0<x<\infty, 0<y<\infty\\ 0 o.w\end{cases}$$

$Find:$

1)$The marginal p.d.f of x.$

2)$The marginal p.d.f of y.$

3)$The marginal c.d.f of x.$

4)$The marginal c.d.f of y.$

5)$show that f(x,y) is a j.p.d.f of x\&y.$

Name:-..: ناو

Code & Group (A) (B) (C)

Department of Statistics

Monthly Exam
Chapter (III)

ID Exam

Sub.: Mathematical Statistics
Date:- 14 – 4- 2011
Time90 minutes

Q1) *40 Marks*

$$f(x;y)=\begin{cases} cx^2y^3 & 0<x<\frac{1}{2} \quad 0<y<1 \\ 0 & o.w \end{cases}$$

Find 1) c? 2) $V(x/y)$

Q2) *40 Marks*

$$f(x;y)=\begin{cases} \frac{1}{15} & (1,3),(3,1),(2,3) \\ \frac{2}{15} & (2,2) \\ \frac{3}{15} & (1,1),(2,1) \\ \frac{4}{15} & (3,2) \\ 0 & o.w \end{cases}$$

1. Calculate correlation of coefficient between x & y
2. X & y are stochastic independent or not?
3. Find the mean[E(y/x)]?
4. Find the c.d.f F(y/x)?

Q3) ***Let*** *20 Marks*

$$f(x,y)=\frac{(2m+2)!}{m!m!}\left(\frac{1}{2a}\right)^{2m+2}x^m(2a-y)^m \qquad 0<x<y<2a$$

proof) $f(x;y)$ *is the j.p.d.f of x and y.*

Which means $\int_0^{2a}\int_0^{y} f(x;y)\,dx\,dy=1$

Dler Hussein Kadir
The examiner

100

Best of Luck

Exer. (1) - Let $x \sim D.U(7)$

Find

$1)\ Mean\ \&\ Var(x)$

$2)\ \Pr(x > \mu_x)$

$3)\ \Pr(\mu - \sigma_x \le x \le \mu + \sigma_x)$

$4)\ Mean\ \&\ Variance\ of\ \ y = 2 + 3x$

Exer. (2) $:-Let\ X\ be\ a\ r.v\ with\ D.U(8)$

$Find: 1)\ p.d.f \qquad 2)\ c.d.f \qquad 3)\ Mean\ \ \&\ V(x)$

$4)\ \Pr(x \le 4) \qquad 5)\ \Pr(x \ge 3).$

Exer. (3) $-Let\ x \sim D.U(n)\ find\ the\ mean\ \&\ Var\ of$

$y = a + bx\ [where\ a\ \&\ b\ are\ real\ cons\tan t]$

Exer. (4) $:-Let\ x \sim br(\frac{3}{4});$

$Find\ \ 1)\ \Pr(X < \alpha_1)? \qquad 2)\ p_r(\mu < x < \mu - \alpha_2)?$

Exer. (5) $If has a M_x(t) = (\frac{1}{3} + \frac{2}{3}e^t)^5$

Find;

$1) the p.d.f of X 2) Mean 3) V(x) 4)\ Pr(\ M - 2\sigma < X < M + 2\sigma)$

Exer. (6) $let X be a binomial dist X \sim b(7, \frac{1}{2})$

$Find: 1) p.d.f of X 2) Mean \& Variance$

$3) The M.g.f of X 4)\ Pr(0 \le X \le 1) 5)\ Pr(X = 5)$

Exer. (7) $let X \sim b(n, p), let y = n - x$

$show that:$

$1) y \sim b(n, q)$

$2) find\ cov(x, n - x)$

Exer. (8) $t x_1, x_2, x_3 be a random sample space 3 and is mutually indep.$

$have same dist. function. [c.d.f. F(x)] and,$

$Let y = middle value of x_1, x_2, x_3 let X_i \le y, i = 1,2,3$

$is the i - tn trial of success find p.d.f of y?$

Exer. (9) $let y \sim bin(n, \frac{1}{4}), and\ Pr(y \geq 1) \geq 0.70$

$find(n)?.$

Exer. (10) $let X be a r.v. has a Poisson dist. with \lambda = 3$

$Find: Pr(x = 2), Pr(x \leq 3), Pr(x \geq 5), Pr(4 \leq x \leq 8)$

Exer. (11) $let X be a r.v., and let p.m.f f(x) be positive one and$

$only one the nonnegative integers, given that:$

$$f(x) = \frac{4}{x} f(x-1) \quad x = 1,2,3,\ldots$$

$find f(x).$

Exer. (12) $let X have a poisson dist. with M = 100 chybyhev's inquality$

$to determins is a lower bound. find: Pr(75 < x < 125)?.$

Exer. (13) $if x has poisson an\ Pr(X = 0) = \frac{1}{2}$

$what is E(x)?$

Exer. (15) $Let x \sim p(\lambda)$

x	0	1	2	3	4	5	6	7
$p(x)$	50	160	130	90	66	4	0	0

$Find\ 1) E(x)\ 2) V(x)\ 3) p.m.f\ 4) M_x(t)$

Exer. (16) $Let X \sim G(p) and\ Pr(X \geq 2) = 0.25$

$Find: 1) p.m.f of x.$

$2) E(x) \& V(x).$

$3) M_x(t).$

Exer. (17) :5 *card are drawn without replacement from an ordinary pack of* (52) *cards, if r.v. x represent the No. of red (diamond) in drawn sample k.*

Find : 1) *The p.m.f of x.* 2) *The pro. that* (4) *cards are red.*

3) *At more two red (dia.) card.* 4) *Mean & Var of* (*x*).

Exer. (18) $oxcontains (20) balls [12 redballs \& 8 whiteballs],$

$weselected 8 balls from this box at random and without replacement.$

$Find the probability of:$

1) $drawing three red balls.$

2) $at least two red balls.$

3) $at most two red balls.$

4) $less than two red balls.$

5) $Not more than two red balls.$

6) $more than four red balls.$

Name:-...: ناو

Code & Group (A) (B) (C)

Department of Statistics

Monthly Exam
Chapter (4)

ID Exam

Sub.: Mathematical Statistics
Date:- 5 – 5- 2011
Time: 90 minutes

Q₁) *Let* $x \sim br(1,p)$ *show that* $\alpha_1 = \frac{q-p}{\sqrt{pq}}$, $\alpha_1 =$ "*Skewnes*" — *25 Marks*

Q₂) *Let* $x \sim H.G(28,n,k)$

knowing that $E(x)=1$ *and* $V(x)=\frac{2}{3}$

Find n,k ? — *25 Marks*

Q₃) *Let* $x \sim bin(n,p)$ and; — *25 Marks*

X_i	0	1	2	3
f_i	4	2	2	1

Find 1) $M_x(t)$? 2) $p_r(x>2)$ 3) $p_r(x<v(x))$

Q₄) : If — *25 Marks*

1) $M_{x1}(t) = 4(25-30e^t+9e^{2t})^{-1}$

2) $M_{x2}(t) = \left(\frac{4}{1-2e^t+e^{2t}}\right)^{-2}$

3) $M_{x2}(t) = \left(\frac{2-2e^t}{e^t-e^{3t}}\right)^{-1}$

Find:

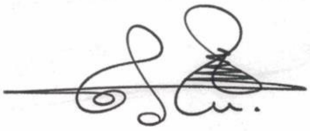
1) *p.m.f for each of them.*

2) $E(x_1)$. $E(x_2)$. $E(x_3)$.

2) $V(x_1)$. $V(x_2)$. $V(x_3)$.

100

Best of Luck



Dler Hussein Kadir
The examiner

Ministry of Higher Education & Scientific Research
Salahaddin University-Erbil
College of Administration and Economics
Department: **Statistics**
Stage: **Third**

Subject: **Mathematical Statistics**
Date: / / 2019
Time: 3 Hours

Final Exam: Second Trial
2018 – 2019

Q1) *Let x be a r.v having the* p.d.f of x

$$p(x) = \begin{cases} c\dfrac{2^x}{x!} & x = 0,1,2,\dots,\infty \\ 0 & o.w \end{cases}$$

Find: 1- *The value of c?*

2- *The c.d.f of x.*

3- *$P_r(x=2)$?*

4- *$P_r(x>2.5)$?*

12 marks

Q2)

$$f(x;y) = \begin{cases} 3cx^2y & 0<x<1\ ,\ 0<y<1 \\ 0 & o.w \end{cases}$$

Find: 1 -c?

2- *Find the variance of(y/x)*

3- *Find the c.d.f.of (x/y)*

12 marks

Q3) A) If $M_{x_1}(t)=(2-e^t)^{-2}$

$M_{x_3}(t)=(1-6t+9t^2)^{-1}$

Find: 1- *P.d.f of X_1 & X_2 & X_3?*

2- *$V(X_1)$ & $V(X_2)$ & $V(X_3)$?*

12 marks

Q4) *Let x be a r.v having the p.m.f of x.*

$$p(x) = \begin{cases} \dfrac{x}{c} & x = 1,2,\dots,n \\ 0 & o.w \end{cases}$$

Find: 1-*The value of the constant c?*

2- *The mode of the distribution. (n=8)*

3- *The median of the distribution. (n=6)*

12 marks

Q5) Let x~ G(p) and $p_r(x \geq 2) = \frac{1}{4}$

Find: 1- *p.m.f of x?*

2- *E(x) &V(x)*

12 marks

Name
Lecturer
Dr. Dler Hussein Kadir

Good Luck

Name
Head of department
Dr. Saman Hussein Mahmood

Ministry of Higher Education & Scientific Research
Salahaddin University-Erbil
College of Administration and Economics
Department: **Statistics**
Stage: **Third**

Subject: **Mathematical Statistics**
Date: 10 /6/ 2019
Time: 3 Hours

Final Exam: First Trial
2018 – 2019

Q1) Let $f(x,y)=\begin{cases}6x^2y & 0<x<1 \quad , \quad 0<y<1\\ 0 & 0.w\end{cases}$

Find 1) $v(y/x)$? 2) Find the mode of the $f(y)$)? **10 marks**

Q2) Let X&Y be two r.v's having the j.p.m.f.

(x,y)	(0,0)	(0,1)	(1,0)	(1,1)	(2,0)	(2,1)
$p(x,y)$	$\frac{1}{18}$	$\frac{3}{18}$	$\frac{4}{18}$	$\frac{3}{18}$	$\frac{6}{18}$	$\frac{1}{18}$

Find: 1) Joint c.d.f $f(x,y)$?

2) The correlation between x &y?

3) $E(x/y)$? **10 marks**

Q3) 1) Let $x \sim br(p)$ Show that $E(x)=p$. [Bernoulli distribution]

2) If $M_x(t)=(1-6t+9t^2)^{-1}$ Find the pdf and Variance of x. **10 marks**

Q4) Let x be r.v have p.d.f

$$f(x)=\begin{cases}1 & o<x<1\\ 0 & ow\end{cases}$$

Find: 1- The p.d.f of $y=-2\ln x$?

2- Show that $p_r[x \ge v(x)] \le 0.5$

3- $M_x(t)$ **10 marks**

Q5) Let x be a r.v having the p.d.f of x

$$f(x)=\begin{cases}15cx^4(1-x)^2 & 0\le x\le 1\\ 0 & o.w\end{cases}$$

Find *1- The value of c?*

2- Find the $pr(y^2<4)$ *of y, when* $y=\sqrt{x}$.

10 marks

Q6) Let $f(x)=c\sqrt{x-x^2} \sim Beta(\alpha,\beta)$;

Find 1) *c?* *2)* $E(x)$? *3)* $v(x)$?

Information $\left|\frac{3}{2}\right.=\sqrt{\frac{\pi}{2}}$

10 marks

Good Luck

Name
Lecturer
Dr. Dler Hussein Kadir

Name
Head of department
Dr. Saman Hussein Mahmood

Salahaddin University
College of Administration and Economics
Department of Statistics

Final Exam
2010-2011

Subject:- Mathematical Statistics
Time:- 3 hrs
Date:- 8th /June/2011

Answer all the questions

Q1) Let $f(x,y)=6x^2y \quad 0<x<1 \; ,0<y<1 \quad and \quad 0 \; o.w$

Find 1) the marginal c.d.f of x? 2) $p_r(0<x<0.5)$
3) find the median of f(x)? 4)find the mode of the f(y)?

8 marks

Q2) a) Let x~ bin(n,p) show that E(x)=np

b) Let x~ exp(θ) show that $M_x(t)=\dfrac{\theta}{\theta-t}$

6 marks

Q3) Let X~N(4,9) and $p_r(|x-4|\le \frac{c}{3})=0.8664$,Find C ?

8 marks

Q4) If $M_{x_1}(t)=(2-e^t)^{-2}$ & $M_{x_2}(t)=e^{3e^t-3}$ & $M_{x_3}(t)=(1-8t+16t^2)^{-1}$

Find; 1) p.d.f of X_1 &X_2&X3? 2) E(X1) & E(X2) & E(X3)? 3) V(X_1) & V(X_2) & V(X_2)?

8 marks

Q5) Let

$$f(y/x)=\frac{c_1y^2}{(1-x^3)} \quad 0<x<y<1 \quad and \quad Zero \quad o.w$$

$$\& f(x)=c_2x(1-x^3) \quad 0<x<1 \quad and \quad zero \quad o.w$$

Find 1) C_1&C_2 ? 2) Correlation between x&y?

3) Show that $p(y\ge 6^{-1})\le 5$ 4)x&y are stochastic independent or not?

8 marks

Q6) Let $f(x)=c\sqrt{x-x^2} \sim Beta(\alpha,\beta)$; Find 1) c? 2)E(x)? 3)V(x)?

6 marks

Q7) $Let \; x \sim bin(n,p)$ and;

X_i	0	1	2	3
f_i	1	4	4	2

Find 1) $M_x(t)$? 2) p_r(x>E(x)) 3) p_r(x<Skewnes)? 4) Mode?

6 marks

Q8) *Let x_1, x_2, x_3, x_4, x_5 a random sample space from Beta distribution [B(3,1)] and $y_1<y_2<y_3<y_4<y_5$ be the order statistics.*
Find 1) $g(y_5)$ 2) $V(y_5)$ 3)$g(y_2,y_4)$ 4) the p.m.f of z? Where $z=(y_5)^3$ is a transformation on y. 5) use cheby shev's inequality to determine lower bounded for the $P(-2 < Y_5<3.875)$

10 marks

Table Values:- N(1)=0.8413 N(1.5)=.9332 N(2)=0.9772 N(2.5)=0.993

$\Gamma(\frac{1}{2})=\sqrt{\pi}$ & $\Gamma(\frac{3}{2})=\frac{1}{2}\sqrt{\pi}$

Dler H.Kadir Deebagai
The examiner