Total No. of Pages: 2 **6373**

Register Number
Name of the Candidate:

M.Sc. DEGREE EXAMINATION, May 2015

(MATHEMATICS)

(SECOND YEAR)

240: MATHEMATICAL STATISTICS

Time: Three hours Maximum: 100 marks

SECTION-A **(8×5=40)**

Answer any EIGHT questions

1. Prove the followings: i) P(B-A)=P(B)-P(A), if $A \subseteq B$ ii) $P(A^C)$=1-P(A) and iii) $P(A^C \cap B)$ =P(B)-P(A$\cap$B) for any two events A and B.
2. If X is a random variable with probability mass function.
   P(X=K)= n_{c_k} $P^K(1-P)^{n-k}$ for k=0,1,2,.....n,0<p<1 then find
   i) E(X) ii) E(X^2) and iii) E(X^3)
3. Suppose that X is geometrically distributed random variable. Find E(X), Var(X) and M(t) the moment generating function of X.
4. Prove that Min $E[X-cy-d]^2=\sigma_1^2(1-\rho^2)$, where C and d are some constants, σ_1^2 =Var(X) and ρ is the correlation coefficient between the random variables X and Y.
5. In the usual notation, show that
   $$\sigma^2_{1,3,4.....n} = \frac{A_{22}}{A_{22.11}}.$$
6. Show that convergence in probability implies convergence in weak sense.
7. If $X_1, X_2, ...X_n$ be a sample drawn from a population with distribution function F(x) and $\overline{X} = \frac{1}{n}\sum_{k=1}^{n} X_k$, show that E($\overline{X}$)= μ and Var ($\overline{X}$)= $\frac{\sigma^2}{n}$
8. Describe two way classification in analysis of variance.
9. Define consistent estimator and sufficient estimator with example.
10. i) Define asymptotically efficient estimator.
    ii) State a necessary and sufficient condition for an estimate T to a be most efficient estimator of θ.

SECTION-B **(3×20=60)**

Answer any THREE questions

11. State and prove inversion theorem.
12. a) If X~N(μ,σ^2), find the central moments of even order.
    b) Let X~ G($1,\beta$), Then prove that P{X >t+s/ x>s}=P(X>t} for any two real numbers 't' and 's'.

13. a) Suppose $X_n \xrightarrow{p} X$ and g is a continuous function defined on R, Then show that $g(X_n) \xrightarrow{P} g(X)$ as $n \to \infty$

b) State and prove Kolmogrov in equality

14. a) If X~ $\chi^2(n)$, then prove that $\lim_{n\to\infty} P\{\sqrt{2x} - \sqrt{2n-1} \le z\} = \int_{-\infty}^{2} \frac{1}{\sqrt{2\pi}} e^{-y^2/2} dy$

b) The following table gives the yield of three varieties of wheat each grown in four plots.

Plots of land	Variety of wheat		
	Per hectare yield ('00kgs)		
	A_1	A_2	A_3
1	6	5	5
2	7	5	4
3	2	3	3
4	8	7	4

Set up ANOVA table. Apply F-ration rest to check whether there is a significant difference among the average yields in the three varieties of wheat.

(Given :F at (2,9) d.f=4.26 at 5% level)

15. State and prove Cramer-Rao inequality.

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