

APR 1 - 2015

M.SC. (Sem II) Examination
Statistics: Paper – V - 2933
(probability and Stochastic process)

Time : 2 Hours]

[Total Marks : 70

1 (a) Let x be a random variable defined on the probability space. Define a point function $F(x)$ on R by $F(x) = p(X \leq x)$ then Prove that $F(x)$ is a distribution function. 7

(b) Check whether the following function is distribution function? 7

$$F(x) = \begin{cases} 0, & \text{if } x < 0 \\ \frac{1}{2} & \text{if } x = 0 \\ \frac{x}{2} + \frac{1}{2}, & \text{if } 0 < x < 1 \\ 1 & \text{if } 1 \leq x \end{cases}$$

(i) State the type of distribution function.

(ii) If it is mixed type, then decompose it in to two parts.

OR

1 (a) Let X be r.v. defined on the probability space and $Q(B) = p\{X^{-1}(B)\}$ then prove that (R, B, Q) is induced probability space 7

(b) explain the following terms: 7

(i) Induced probability space (ii) Sigma-field (iii) Probability measure, (iv) Distribution function .

2 (a) State and prove Kolmogorov's inequality. Show that it is generalization of Chebychev's inequality. 7

(b) Check whether following sequence SLLN hold good 7

$$P_r(X_k = \pm 2^k) = 2^{-(2k+1)}$$

$$P_r(X_k = 0) = 1 - 2^{-2k}$$

7

OR

2 (a) In usual notation prove following result. 7

(i) X_n a. s. $\xrightarrow{a.s.} X_n \xrightarrow{p} x$

(b) State and prove Holder's inequality

- 3 (a) For $p \geq 1$ prove that , 8

$$\{E|X + Y|^p\}^{1/p} \leq \{E|X|^p\}^{1/p} + \{E|Y|^p\}^{1/p}$$

- (b) Define (i) markov chain (ii) parametric space (iii) stationary process (iv) evolutionary process. 6

OR

- 3 (a) state and prove Lipounov's form of CLT. 7

- (b) Check whether the following function is distribution function. Find discontinuity point of the function. State the type of distribution function. 7

$$F(x) = \begin{cases} 0, & \text{if } x < 2 \\ -1 + \frac{2}{3}, & 2 \leq x \leq 3 \\ 1, & x \geq 3 \end{cases}$$

- 4 (a) determine the classes and periodicity of the various states for M.C. with t.p.m

$$p = \begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{pmatrix} \quad 7$$

- (b) Stating necessary assumptions of poisson process, derive differential equation of it. 7

OR

- 4 (a) Explain linear growth process. Derive differential equation of it. 7

- (b) state and prove kolmogorov's SLLN. 7

- 5 (a) state and prove two property of poisson process 7

- (b) write note on Yule Fury process. 7

OR

- 5 (a) State and prove chapman-Kolmogorov equation for higher transition probability 7

(b) explain linear growth process and derived differential difference equation of it in terms of moment

7
