M 9275

Reg. No. : .....

Name : .....

II Year B.Sc. Degree (SDE-2011 Admn. Onwards-Reg./Sup./Imp.) Examination, April 2015

Complementary Course in Statistics

SDE 2 C02 STA : PROBABILITY DISTRIBUTION AND STATISTICAL INFERENCE

Time : 3 Hours Max. Weightage : 30

***Instruction** : Use of Logarithm/Statistical Tables and Calculators are **permitted**.*

PART – A

Answer **all** questions :

I. 1) If X has Bernoulli distribution with $p = \frac{1}{4}$, then V(x) = _____

2) Mean of rectangular distribution having $f(x) = \frac{1}{b-a}$, a<x<b is _____

3) Area property of normal distribution states that $P(\mu - 3\sigma < x < \mu + 3\sigma) =$ _____ where $X \to N(\mu, \sigma^2)$.

4) If $x_1, \ldots x_n$ are iid random variables with mean μ and variance σ^2, then $\frac{\frac{S_n}{n} - \mu}{\sigma / \sqrt{n}} \to$ _____ as $n \to \infty$, $S_n = x_1 + \ldots + x_n$. **(¼×4 weightage 1)**

II. 5) If t_n is an estimator of parameter θ, based on a sample of size n, given $\varepsilon > 0$, if $P[|t_n - \theta| < \varepsilon] \to 1$ as $n \to \infty$, t_n is said to be _____ estimator of θ.

6) If x is a random variable having $f(x) = \frac{1}{\theta}$, $0 < x < \theta$, maximum likelihood estimator of θ is _____

7) The Cramer Rao lower bound for the variance of an estimator of parameter θ is given by _____

8) The 95% confidence interval for population proportion p of Binomial population is _____ **(¼×4 weightage 1)**

P.T.O.

PART – B

III. Answer **any 8** questions :

9) Define covar (x, y) for a pain (x, y) of random variables.

10) If var (x) = 1, find var (2x + 7).

11) Show that $M_{CX}(t) = M_X(Ct)$ where C is a constant.

12) Define characteristic function of random variable X (continuous).

13) State Bernoulli's law of large numbers.

14) What is meant by 'bias' of an estimator ?

15) Define the terms (1) critical region and (2) level of significance of a test.

16) State Fisher-Neyman factorization theorem.

17) Write down the application of Neyman-Pearson lemma in testing of hypothesis.

(Weightage 1 each)

PART – C

IV. Answer **any 6** questions :

18) The joint probability distribution of (x, y) is given below. Find the correlation coefficient γ (x, y) between x and y.

y \ x	−1	1
0	1/8	3/8
1	2/8	2/8

19) Derive mode of Binomial distribution.

20) Derive recurrence relation between central moments of Poisson distribution.

21) Find mean and variance of Gamma distribution having pdf

$$f(x) = \frac{1}{\alpha\,\beta^{\alpha}} x^{\alpha-1} e^{-x/\beta},\ x \geq 0.$$

22) State and prove Tchebycheffs inequality.

23) Find maximum likelihood estimate of θ if x has pdf $f(x) = (\theta+1)x^{\theta}$, $0 \leq x \leq 1$, $\theta > 0$.

24) Find moment estimator of θ for a population having pdf

$$f(x) = \frac{1}{\theta} e^{-x/\theta}, x \geq 0, \theta > 0.$$

25) Explain test procedure to test $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 > \sigma_0^2$, σ^2 being variance of a normal population.

26) If 60 out of a group of 1000 insured persons died within a year, examine whether only 4% are likely to die within a year is justifiable. **(Weightage 2 each)**

PART – D

V. Answer **any 2** questions :

27) (a) State and prove additive property of chi-square distribution (b) Establish relationship between t, ψ^2 and F distributions.

28) Derive MGF of normal distribution. Hence find the mean of the distribution.

29) Derive $(1 - \alpha)100\%$ confidence interval for the difference between means of 2 normal populations having equal variances (unknown) based on small samples.

30) 100 students were classified according to their brilliance and community (at levels B_1, B_2 and A_1, A_2, A_3). Examine whether there is any relation between community and brilliance.

	B_1	B_2	Total
A_1	215	135	350
A_2	325	175	500
A_3	60	90	150
Total	**600**	**400**	**1000**

(Weightage 4 each)