

Total No. of Questions : 4]

SEAT No. :

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[Total No. of Pages : 2

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S.Y.B.Sc.

STATISTICS

**ST-242: Sampling Distribution and Exact Tests
(24172) (2019 CBCS Pattern)(Semester-IV) (Paper -II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of statistical tables and calculator is allowed.*

Q1) Attempt each of the following:

a) In each of the following cases, choose the correct alternative : **[1 each]**

i) Let $X \rightarrow G(1,3)$ then variance of X is

- | | |
|------|------------------|
| A) 3 | B) $\frac{1}{3}$ |
| C) 1 | D) 9 |

ii) Let $X \rightarrow \chi_6^2$ then which of the following is true?

- | | |
|------------------|------------------|
| A) $\mu_2' = 6$ | B) $\mu_2' = 12$ |
| C) $\mu_2' = 36$ | D) $\mu_2' = 48$ |

iii) Let $X \rightarrow t_7$ then distribution of $Y = \frac{1}{X^2}$ is

- | | |
|--------------|--------------|
| A) $F_{1,1}$ | B) $F_{1,7}$ |
| C) $F_{7,7}$ | D) $F_{7,1}$ |

b) In each of the following, state whether the given statement is true or false: **[1 each]**

i) Let $X \rightarrow N(\mu, \sigma^2)$ μ known, the test statistic for testing $H_0 : \sigma^2 = \sigma_0^2$ Vs $H_1 : \sigma^2 \neq \sigma_0^2$ follows chi-square distribution.

ii) Let $X \rightarrow t_{10}$ then the mode of X is 10.

P.T.O.

Q2) Attempt any **two** of the following: **[5 each]**

- a) Obtain moment generating function of chi square distribution with n degrees of freedom.
- b) Derive an expression for r^{th} raw moment of F- distribution with n_1 and n_2 degrees of freedom. Hence find mean of the distribution.
- c) Describe the test procedure for testing $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 \neq \sigma_0^2$.

Q3) Attempt any **two** of the following: **[5 each]**

- a) State and prove additive property of Gamma distribution.
- b) Let X and Y are independent chi square random variables with m and n degrees of freedom respectively, show that $U = X + Y$ and $V = \frac{X}{X + Y}$ are independently distributed.
- c) Find $(2r)^{\text{th}}$ central moment (μ_{2r}) of t distribution with n degrees of freedom.

Q4) Attempt any **one** of the following.

- a)
 - i) Let X_1, X_2, \dots, X_{10} be independent and identically distributed $N(5, 10)$ random variates. Calculate $P[\bar{X} \geq 4, \sum_{i=1}^{10} (X_i - 5)^2 \geq 72.67]$. **[5]**
 - ii) Explain paired t-test along with the assumptions made. Give one illustration in which this test can be used. **[5]**
- b)
 - i) A random sample of 10 boys has mean weight of 63.2 kg with standard deviation of 7 kg. Test whether mean population weight of boys is 60 kg. [Use $\alpha = 0.05$] **[5]**
 - ii) Show that median of $F_{n,n}$ is unity. **[3]**
 - iii) Let t_{12} follows Student's t-distribution with 12 degrees of freedom find 'c' such that $P(-c < t_{12} < c) = 0.8$. **[2]**

