

U.G. 5th Semester Examination-2025**STATISTICS****[MINOR]****Course Code : ST-MI-5.1-T****[NEP-2020]**Full Marks : $\begin{cases} 35(30+5) \\ 50(40+10) \end{cases}$

Time : 2 Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.**Notations and symbols have their usual meaning.***Answer all the questions from Selected Option.****OPTION-A****ST-MI-5.1-T****(Applied Statistics)****[Marks:35(30+5)]****(Theoretical)**

1. Answer any five questions: $2 \times 5 = 10$
 - a) Define Age Specific Death Rate.
 - b) Distinguish between Process Control and Product Control.
 - c) Write down Laspeyres' price index number and Paasche's price index number formulas.
 - d) What do you mean by 'assignable' and 'chance' causes of variation of the quality of a product?
 - e) What is the use of Cost of Living Index Number?
 - f) Write down the components of a time series with their brief explanations.

- g) Define Gross Reproduction Rate.
- h) Write down the merits and demerits of multiplicative model of a time series.
2. Answer any **two** questions: $5 \times 2 = 10$
- Describe c-chart in each of the cases when standard is given and not given.
 - How do you find quadratic trend equation by the method of least squares?
 - How do you compare mortality situation of two different places by standardised death rate?
 - In construction of price index numbers how do you choose the base period and select the commodities?
3. Answer any **one** question: $10 \times 1 = 10$
- Describe the process of measuring seasonal variation of a time series by ratio to trend method.
 - Show that Fisher's ideal index number satisfies both the time reversal and factor reversal tests. $5+5$
 - What is a life table and what is the use it? Describe different functions associated with a life table.
 - Describe $\bar{X}$ chart in cases when standards are given and are not given. $5+5$

[Internal Assessment:5]

OPTION-B
ST-MI-5.1-T
(Sampling Distribution)
[Marks:50(40+10)]
(Theoretical)

1. Answer any **five** questions : $2 \times 5 = 10$
- What is sampling distribution of a statistic and what is its standard error?
 - Define and sketch the probability density function of chi-square (χ^2) distribution.
 - Write two applications of F -distribution.
 - Distinguish between parameter and statistic.
 - Write two applications of chi-square (χ^2) distribution.
 - Explain: Student's t -distribution curve is symmetrical about mean.
 - Define sample mean and sample variance.
 - What is the problem of interval estimation?
2. Answer any **two** questions: $5 \times 2 = 10$
- Prove or disprove the statement: the variance is the twice of mean for a chi-square (χ^2) with n degrees of freedom.
 - Derive the m. g. f. of a chi-square (χ^2) distribution with $n. d. f.$

c) Compute the mean, variance and points of inflexion of F_{n_1, n_2} distribution.

d) Establish the relation of F_{n_1, n_2} with that of

$$\frac{1}{F_{n_1, n_2}}.$$

3. Answer any two questions: $10 \times 2 = 20$

a) Suppose X and Y are independent normal variables each with mean μ and variance σ^2 . Show that $U = X+Y$ and $V = X-Y$ are independently distributed as normal variables. Find their means and variances.

b) Let X and Y be two *iid* $N(0, \sigma^2)$ variables. Derive the distribution of X/Y .

c) If X and Y are independent standard normal variates, show that the mean value of the greater of $|X|$ and $|Y|$ is $\frac{2}{\sqrt{\pi}}$.

d) Let the variables X_i ($i = 1, 2, 3$) be independently and identically distributed as $N(0, 1)$. Obtain the following probabilities using statistical tables.

i) $P[2X_1 + 3X_2 + 5X_3 \geq 5]$

ii) $P[X_1^2 + X_2^2 + X_3^2 \geq 5]$ 5+5

[Internal Assessment:10]