STATISTICS HSSC–II
SECTION – A (Marks 17)

Time allowed: 25 Minutes

NOTE: Section–A is compulsory and comprises pages 1-2. All parts of this section are to be answered the question paper itself. It should be completed in the first 25 minutes and handed over to Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

Q. 1 Circle the correct option i.e. A / B / C / D. Each part carries one mark.

(i) Through venn diagram the sample space is denoted by:

    A.   Circle   B.   Triangle

    C.   Rectangle   D.   Square

(ii) An arrangement of objects in a definite order is called:

    A.   Permutation   B.   Combination

    C.   Set   D.   None of these

(iii) Mode of the Binomial distribution $\left(\dfrac{1}{2}+\dfrac{1}{2}\right)^{20}$ will be:

    A. $\dfrac{1}{2}$ B. $\dfrac{1}{20}$

    C.   5   D.   10

(iv) A question has five multiple-choice answers. Probability of guessing an incorrect answer is:

    A. $\dfrac{3}{5}$ B. $\dfrac{4}{5}$

    C. $\dfrac{1}{5}$ D. $\dfrac{5}{5}$

(v) For positively skewed binomial distribution:

    A. $p=q$ B. $p<q$

    C. $p>q$ D. $p=0$

(vi) Random numbers are sequence of digits from the set:

    A.   {0, 1, 2, ..., 10}   B.   {0, 1, 2, ..., 9}

    C.   {1, 2, 3, ..., 9}   D.   {1, 2, 3, ..., 10}

(vii) If X and Y are independent random variables, then $Var(X-Y)$ is equal to:

    A. $Var(X)-Var(Y)$ B. $Var(X)\times Var(Y)$

    C. $E(X-Y)^2$ D. $Var(X)+Var(Y)$

(viii) The range of normal distribution is:

    A. 0 to $+\infty$ B. $-\infty$ to 0

    C. $-\infty$ to $+\infty$ D. -1 to $+1$

(ix) In Normal distribution $Q_1 = 20$ and $Q_3 = 40$, then mean is equal to:

A. 20   B. 30

C. 40   D. 60

(x) Standard deviation of the sampling distribution of a statistic is called:

A. Sampling error   B. Non-sampling error

C. Standard error   D. Dispersion

(xi) Level of confidence is donated by:

A. α B. β

C. $1 - \beta$ D. $1 - \alpha$

(xii) Which test-statistics should be preferred to test the population mean when the population variance is known?

A. t-statistic   B. z-statistic

C. χ^2-statistic   D. None of these

(xiii) The calculated value of the Chi-square could not be:

A. Positive   B. Negative

C. Zero   D. None of these

(xiv) In testing independence in a 2×3 contingency table, the number of degrees of freedom in χ^2-distribution is:

A. 1   B. 2

C. 3   D. 5

(xv) If $\dfrac{6\sum d^2}{n(n^2 - 1)}$ is zero, the value of r_s is:

A. 0   B. 0.5

C. -1 D. 1

(xvi) Drag and drop is a term associated with:

A. Mouse   B. Keyboard

C. Printer   D. Scanner

(xvii) In computer language 1 KB is equal to:

A. 1024 terabytes   B. 1024 gigabytes

C. 1024 megabytes   D. 1024 bytes

For Examiner's use only:

Total Marks: 17

Marks Obtained:

Time allowed: 2:35 Hours **Total Marks Sections B and C: 68**

NOTE: Sections 'B' and 'C' comprise pages 1–2 and questions therein are to be answered on the separately provided answer book. Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. Use supplementary answer sheet I.e. Sheet–B if required. Write your answers neatly and legibly. Statistical table will be provided on demand.

SECTION – B (Marks 42)

Q. 2 **Attempt any FOURTEEN parts. All parts carry equal marks.** **(14 x 3 = 42)**

(i) How many possible permutations can be formed from the following words?

   a. Statistics b. Committee

(ii) What is the difference between an outcome and an experiment?

(iii) If two coins are tossed, find the probability of getting at most one head.

(iv) Given $E(X) = 0.55, Var(X) = 1.55$ and $Y = 2X + 1$. Find $E(Y)$ and $Var(Y)$.

(v) A continuous random variable X that can assume values between 2 and 5 has a density function given by $f(x) = \dfrac{2(1+x)}{27}$.   Find   (a) $P(x < 4)$ (b) $P(x = 3.5)$

(vi) In a binomial distribution the mean and standard deviation were found to be 4.5 and 1.5 respectively. Find n and p.

(vii) State any three properties of the binomial experiment.

(viii) If $N = 10, n = 4$ and $k = 3$. Find the standard deviation of hypergeometric distribution.

(ix) The standard deviation of a normal distribution is 2. Find its first four moments about mean.

(x) Give briefly the importance of the normal distribution.

(xi) A normal distribution has mean $\mu = 80$ and standard deviation $\sigma = 36$. Find its mode and the quartiles Q_1 and Q_3.

(xii) Given $p_1 = \dfrac{2}{3}$, $n_1 = 2$, $p_2 = \dfrac{1}{2}$, $n_2 = 2$. Find $\mu_{\hat{p}_1 - \hat{p}_2}$ and $\sigma_{\hat{p}_1 - \hat{p}_2}$.

(xiii) Given $N = 310, n = 100$ and $\sigma_{\bar{x}}^2 = 35$. If sampling is done without replacement, then find σ.

(xiv) Differentiate between sampling with replacement and sampling without replacement.

(xv) Given $n = 500$, $\hat{p} = 0.08$, $Z_{\frac{\alpha}{2}} = Z_{0.005} = 2.58$. Find the 99% confidence interval for the population proportion.

(xvi) Given $n_1 = 48, \overline{X}_1 = 90, n_2 = 72, \overline{X}_2 = 85, S_1^2 = 12, S_2^2 = 18, Z_{\frac{\alpha}{2}} = 1.96$. Find 95% confidence interval for $\mu_1 - \mu_2$.

(xvii) Formulate the null and alternative hypothesis is each of the following:

   a. No more than 45% people pay Zakat.

   b. The average income of nurses is Rs. 36250.

(xviii) Given the following information $N = 150, (A) = 30, (B) = 60, (AB) = 12$. Show that attributes A and B are independent.

(xix) Differentiate between 'RAM' and 'ROM'.

Note: **Attempt any TWO questions. All questions carry equal marks.**   **(2 x 13 = 26**

Q. 3   **a.**   From a well shuffled pack of 52 cards, a card is drawn at random. What is the probability that it is: **(05)**

     (i)   a card of clubs   (ii)   a jack of spades

     (iii)   a pictured card   (iv)   jack of clubs or queen of diamonds

     (v)   a face card

   b.   A committee of size 4 is to be selected at random from 5 women and 3 men. Find the expected

     number of women on the committee.   **(08)**

Q. 4   **a.**   If $X \sim N(20,25)$, then find: **(04)**

     (i) $P(22 < X < 28)$

     (ii) $P(10 < X < 18)$

   b.   A population consists of values 2, 2, 8.   **(09)**

     (i)   Draw all possible samples of size 2 with replacement. Calculate the mean of each sample.

     (ii)   Form a frequency distribution of $\overline{X}$.

     (iii)   Find the mean and variance of the sampling distribution of $\overline{X}$.

     (iv)   Find the mean μ and the variance σ^2 of the given population.

     (v)   Show that the populations mean is equal to the mean of means of all samples.

     (vi)   Show that population variance is twice the variance of sample means.

Q. 5   **a.**   Find the value of 't' for the following varieties in a sample of eight: $-4, -2, -2, 0, 2, 2, 3, 3$, taking

     the mean of the population to be zero. Test the significance of the mean at $\alpha = 0.05$.   **(05)**

   b.   In a public opinion survey, 2000 persons were interviewed to give their opinion. The individuals
interviewed are classified according to their attitude on a certain social scheme and according to
gender. The data is given in the table below: **(08)**

Social scheme / Gender	Favour	Oppose	Undecided
Male	600	320	280
Female	450	280	70

Calculate χ^2 to examine whether gender differ in their opinion about the social scheme at $\alpha = 0.05$.