| Roll No. | | | | | | | | Answer Sheet No._____ |

Sig. of Candidate._____   Sig. of Invigilator._____

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 on the question paper itself. It should be completed in the first 25 minutes and handed over to the 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) When a coin and a die are rolled together, all possible outcomes are_____

    A. 2   B. 6

    C. 8   D 12

(ii) If $P(A/B)=P(A)$ and $P(B/A)=P(B)$, then A and B are _____

    A. Mutually exclusive events   B. Equally likely events

    C. Independent events   D. Dependent events

(iii) If $P(B/A)=0.25$ and $P(A \cap B) = 0.20$, then P(A) is_____.

    A. 0.05   B. 0.80

    C. 0.95   D. 0.75

(iv) Which of the following cannot be taken as probability of an event?

    A. 0   B. 0.5

    C. 1   D. – 0.5

(v) Given $E(X)=5$ and $E(Y)=$ 2, then $E(X-Y)$ is_____.

    A 3   B 7

    C. 5   D. −2

(vi) If 'C' is a constant in a continuous probability distribution $p(x = C)$ is_____.

    A. Zero   B. Positive

    C. One   D. Impossible

(vii) What is the value of Var $(8 - 4X)$?

    A. $8+4 \, Var(X)$ B. $8+16 \, Var(X)$

    C. $16 \, Var(X)$ D None of these

(viii) For a binomial probability distribution with $n=5, p=1/2$, then $P(X=3.5)$ is _____

    A. 0.4593   B. 0

    C. - 0.1986   D 1.0831

(ix) If X is hypergeometric random variable with $N=20$, $K=4$ and $n=6$, it can assume any discrete value from _____

    A. 0, 1, 2,...,6   B. 0,1,2,3,4

    C. 1,2,3,4   D. 1,2,3,...,6

(x)   The points of inflection of the normal curve with mean μ and variance σ^2 lie at _____

A. $\mu - \sigma$ and $\mu + \sigma$ B. $\mu - 2\sigma$ and $\mu + 2\sigma$

C. $\mu - 3\sigma$ and $\mu + 3\sigma$ D.   None of these

(xi)   If a normal distribution with $\mu = 200$ has P(X>225)=0.1587, then P(X<175) equal to _____

A.   0.3413   B.   0.8413

C.   0.1587   D.   0.5000

(xii) A border patrol check point that stops every passenger van is using _____.

A.   Simple Random sampling   B.   Systematic sampling

C.   Stratified sampling   D.   Complete enumeration

(xiii) The difference between the values of a statistic and a parameter is called _____.

A.   Sampling error   B.   Non-sampling error

C.   Standard error   D.   Bias

(xiv) The level of confidence is denoted by _____.

A. α B. $1 - \alpha$

C. β D. $1 - \beta$

(xv)   A failing student is passed by an examiner. It is an example of _____.

A.   Type I error   B.   Type II error

C.   Correct decision   D.   Sampling error

(xvi) In an unpaired sample t-test with sample sizes $n_1 = 11$ and $n_2 = 11$, the value of tabulated t should be

obtained for _____.

A.   10 degree of freedom   B.   21 degree of freedom

C.   22 degree of freedom   D.   20 degree of freedom

(xvii) For a 3 x 3 contingency table, the number of cells in the table is _____.

A.   3   B.   6

C.   9   D.   4

_____

For Examiner's use only:

Total Marks:	17
Marks Obtained:	

STATISTICS HSSC-II

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.

SECTION – B (Marks 42)

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

(i)   A company has 8 directors. In how many ways can the following be selected:

      a.   Chairman, MD, Executive Director

      b.   Three members to form a sub-committee

(ii)   Define the following:

      a.   Sample space

      b.   Mutually Exclusive events

      c.   Independent events

(iii)   Consider two events A and B such that $P(\bar{A})=1/3$, $P(B/A)=3/5$ and $P(B/\bar{A})=4/5$. Find $P(B)$.

(iv)   The probability that a boy will pass an examination is 3/5 and that for a girl it is 2/5.

      What is the probability that at least one of them passes the examination?

(v)   What is a Probability Distribution? In how many ways can you express a probability distribution?

(vi)   Let X has the following probability distribution:

x	-1	0	1	2	3
$f(x)$	0.125	0.50	0.20	0.05	0.125

      Find the probability distribution of:

      a.   (2X-3)

      b. $(x^2 - 1)$

(vii)   What is a binomial distribution? Write its four important properties.

(viii) A random variable X is believed to follow a binomial distribution b(x;5,p). If $P(X=0)=\dfrac{243}{1024}$, find $P(X=3)$.

(ix)   Given X is a binomial random variable with parameters n=1 and p. Find its Mean and S.D.

(x)   What is a Normal distribution? Describe its four properties.

(xi)   The standard deviation of a normal distribution is 4. Find its first four moments about mean.

(xii)   Differentiate between Parameter and Statistic. Why is a parameter said to be constant and statistic a variable?

(xiii) Given $N_1 = 3$ and $N_2 = 3$, $P_1 = \frac{1}{2}$ and $P_2 = \frac{1}{3}$, $n_1 = 2$ and $n_2 = 2$. Find $E(\hat{P}_1 - \hat{P}_2)$ and

      S.E $(\hat{P}_1 - \hat{P}_2)$ when sampling is done without replacement.

(xiv)   What is an Unbiased estimator? Is it possible to have more than one unbiased estimator for an unknown parameter? Give an example.

(xv)   A random sample of 400 members of labour force in a certain region showed that 32 were employed. Construct 95% confidence interval for proportion of unemployed in the region.

(xvi)   Describe the procedure for testing hypothesis about mean of a normal population when population Standard Deviation is unknown and the sample size is small.

(xvii) A random sample of size 100 is taken from normal population with an S.D of 40. If the sample mean=220, test the hypothesis that $\mu \leq 200$ at $\alpha = 5\%$ level of significance.

(xviii) If there are 144 As and 384 Bs in 1024 observations, how many ABs and $\alpha\beta s$ are required so that A and B are independent.

(xix) Write the name of the main computer units.

SECTION – C (Marks 26)

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

Q. 3   **a.**   One bag contains 4 white balls and 3 black balls. A second bag contains 3 white balls and 5 black balls.One ball is drawn from the first bag and placed unseen in the second bag. What is the probability that a ball now drawn from the second bag is black?   **(05)**

b.   Five balls are drawn from a box containing 7 red and 4 blue balls. If X denotes the number of red balls drawn from the box, obtain the probability distribution of X. Compute the mean and variance of this distribution. Compare your results with the theory.   **(08)**

Q. 4   **a.**   In a normal distribution Mean is 300 and variance is 100, find: **(04)**

(i)   The area above 314

(ii) D_8

b.   Let $\bar{X}_1$ represent the means of the sample of size $n_1 = 2$ drawn without replacement from a population consisting of 4, 6, 8, 10. Similarly let $\bar{X}_2$ represent the means of the samples of size $n_2 = 2$ drawn without replacement from another population consisting of 2, 4, 6:   **(09)**

(i)   Find all possible differences between sample means i.e $(\bar{X}_1 - \bar{X}_2)$.

(ii)   Construct the sampling distribution of $(\bar{X}_1 - \bar{X}_2)$ and compute its mean and variance.

(iii)   Verify the results using formulae.

Q. 5   **a.**   Samples of sizes $n_1 = 10$ and $n_2 = 15$ are drawn from the normal populations with the same but unknown standard deviation. The means of the samples are $\bar{X}_1 = 20, \bar{X}_2 = 15$ and the unbiased sample variances are 16 and 14. Is the difference between sample means significant? Use $\alpha = 5\%$ **(06)**

b.   Given the following data: **(07)**

Education \ Gender	Middle	High	College
Male	220	270	110
Female	120	45	35

Do the data suggest association between education and gender? Use $\alpha = 1\%$

—— 2HA 1413 ——