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# STATISTICS HSSC–II

## SECTION – A (Marks 17)

Time allowed: 25 Minutes

**Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed.**

*Do not use lead pencil.*

حصہ اوّل لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

**Answer Sheet No.** _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پُر کریں۔ **Invigilator Sign.** _____

**Fill the relevant bubble against each question according to curriculum:** **Candidate Sign.** _____

| | Question | A | B | C | D | A | B | C | D |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Probability is numerical measurement of: | Certainty | Uncertainty | Quality | Quantity | ○ | ○ | ○ | ○ |
| 2. | A single letter is selected at random form the word "Statistics", then probability of vowel letters is? | 2/10 | 3/10 | 4/10 | 7/10 | ○ | ○ | ○ | ○ |
| 3. | A non-orderly arrangement of objects is called: | Permutation | Combination | Factorial | Space set | ○ | ○ | ○ | ○ |
| 4. | For two independent events A and B, P(A)=0.50 and P(B)=0.30, then $P(A \cap B) =$ | 0.15 | 0.55 | 0.65 | 0.80 | ○ | ○ | ○ | ○ |
| 5. | If X is a continuous random variable, then the function f(X) is called: | Probability function | Probability density function | Cumulative distribution function | Discrete probability function | ○ | ○ | ○ | ○ |
| 6. | Given that E(X)=4 and E(Y)=2, then what is the value of E(3X+Y)? | 10 | 12 | 14 | 16 | ○ | ○ | ○ | ○ |
| 7. | A variable whose values are determined by the outcomes of a random experiment is called: | Finite variable | Qualitative variable | Random variable | Standard veriable | ○ | ○ | ○ | ○ |
| 8. | The binomial distribution is symmetrical when: | $p < q$ | $p > q$ | $p = q$ | $np = npq$ | ○ | ○ | ○ | ○ |
| 9. | In a hyper geometric experiment the successive trials are: | Independent | Dependent | Infinite | Exhaustive | ○ | ○ | ○ | ○ |
| 10. | $x$ follows binomial distribution, then mean of $b(x;10,1/2)$ is: | 2 | 5 | 10 | 15 | ○ | ○ | ○ | ○ |
| 11. | In normal distribution, $\sigma = 10$, then mean deviation will approximately be: | 8 | 10 | 15 | 20 | ○ | ○ | ○ | ○ |

| | Question | A | B | C | D | A | B | C | D |
|---|---|---|---|---|---|---|---|---|---|
| 12. | In normal distribution, $P(Z \leq -1) = 0.1587$, then $P(Z > 1) =$ | 0.4987 | 0.4772 | 0.3413 | 0.1587 | ○ | ○ | ○ | ○ |
| 13. | If $\sigma^2 = 25, n = 25$ and sampling is done with replacement, then standard error of mean $(\delta_{\bar{x}})$ is equal to: | 1 | 5 | $\frac{1}{\sqrt{5}}$ | $\sqrt{5}$ | ○ | ○ | ○ | ○ |
| 14. | A numerical value calculated from sample is called: | Parameter | Statistic | Mean | Estimate | ○ | ○ | ○ | ○ |
| 15. | The critical region of the test is decided keeping in view of: | Null Hypothesis | Alternative Hypothesis | Test statistic | Level of significance | ○ | ○ | ○ | ○ |
| 16. | For contingency table, If total degree of freedom is 12 and number of rows are 5, then number of columns will be: | 3 | 4 | 5 | 6 | ○ | ○ | ○ | ○ |
| 17. | In computer, RAM holds the data/instruction: | Permanently | Temporarily | Partially | Casually | ○ | ○ | ○ | ○ |



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# STATISTICS HSSC–II

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

**NOTE: Answer any fourteen parts from Section 'B' and any two questions from Section 'C'. 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 word "COMMITTEE"?

(ii) Describe the terms: trial, outcome and sample space.

(iii) Three unbiased coins are tossed. What is probability of (a) two heads (b) at most two heads.

(iv) Find the mean and variance of $Y = 2X + 6$, if $E(X) = 4$ and $V(X) = 3$

(v) The probability that a stolen car will be recovered in a city is $0.60$. What is the probability that $7$ out of $10$ cars stolen in the city will be recovered?

(vi) Describe hyper geometric experiment.

(vii) In a binomial distribution the mean and standard deviation are $5$ and $2$ respectively. Find n and p.

(viii) If $N = 10, n = 3$ and $K = 7$. Calculate mean and variance of hyper geometric distribution theoretically.

(ix) In a normal distribution, $Q_1 = 10$ and $Q_3 = 20$. Calculate $\mu$ and $\sigma$

(x) Write down any six properties of normal distribution.

(xi) If $X$ is normally distributed with $\mu = 5$ and $\sigma = 3$, find the value of maximum ordinate correct to two decimal places.

(xii) For $n = 10, P = \frac{1}{2}$ Find standard error of sample proportion when sampling is done by 'with replacement'.

(xiii) It is given that $n = 100, \mu_{\bar{x}} = 15$ and $\delta_{\bar{x}} = 2.5$. Find $\mu$ and $\sigma$ if sampling is done by 'with replacement'.

(xiv) Describe estimation, estimate and estimator.

(xv) Find 95% confidence interval for the mean of a population if $n = 25, \overline{X} = 83, \delta = 7, Z_{0.025} = 1.96$

(xvi) Differentiate between type-I error and type-II error.

(xvii) Given $H_o : \mu_1 = \mu_2$ *vs* $H_1 : \mu_1 \neq \mu_2$ $n_1 = 30, n_2 = 40, \overline{X}_1 = 60, \overline{X}_2 = 50, \quad S_1^2 = 36, S_2^2 = 25, \alpha = 0.05, Z_{0.025} = 1.96$ calculate test statistic and make the decision.

(xviii) Given $N = 1216, (A) = 304, (AB) = 256, (B) = 1024$. Prepare $2 \times 2$ contingency table and calculate coefficient of association.

(xix) Describe low level and high level languages of computer.

## SECTION – C (Marks 26)

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

**Q. 3** **a.** Two friends A and B appear in an interview for two vacancies in an office. The probability that A will be selected is $\frac{1}{4}$ and the probability that B will be selected is $\frac{1}{5}$. What is the probability that

(i) Only one will be selected
(ii) Both will be selected
(iii) None will be selected
(iv) At least one will be selected.

**b.** A continuous random variable X has the probability density function $f(x)=\frac{2x+3}{18}$ for $2 \le X \le 4$, Show that $f(x)$ is a complete probability density function and compute:

**(i)** $P(2 \le X \le 3)$ **(ii)** $P(X > 2.5)$ **(iii)** $P(X < 3.5)$

**Q. 4** **a.** A traffic study conducted at one point on highway shows that the vehicles' speeds are normally distributed with a mean of $60.0 km/hr$ and standard deviation of $3.0 km/hr$. If the vehicle is checked randomly, what is the probability that its speed is **(i)** Below $54 km/hr$ **(ii)** Above $63 km/hr$

**b.** Draw all possible samples of 3 letters by 'without replacement' from the word "Paper". Find the proportion of letter "P" in each sample. Construct sampling distribution of sample proportion and verify that:

(i) $\mu_{\hat{p}} = p$ (ii) $\delta^2_{\hat{p}} = \frac{pq}{n}\left(\frac{N-n}{N-1}\right)$

**Q. 5** **a.** Samples of two types of electric light bulbus were tested for the length of life time and the following data were recorded

$Type\ I: \quad n_1 = 5, \quad \overline{X} = 1224 hrs, \quad \Sigma(X-\overline{X})^2 = 6484$
$Type\ II: \quad n_2 = 7, \quad \overline{Y} = 1036 hrs, \quad \Sigma(Y-\overline{Y})^2 = 11200$

Assume that the population of two types have the same variance. Test the hypothesis that two means are significantly different at 5% level of significance.

**b.** The following table shows the linking's of three colours : pink, white and blue in a sample of 200 males and females. Test whether there is any relation between gender and colour at 5% significance level. (Tabulated value $X^2_{0.05(2)} = 5.99$ )

| Clours | Gender | |
|---|---|---|
| | Male | Female |
| Pink | 20 | 40 |
| White | 40 | 20 |
| Blue | 60 | 20 |