

वे स्टूडेंट्स कॉम्पोजिशन

501

Set No. 1

Question Booklet No.

00278

15P/297/4

(To be filled up by the candidate by blue/black ball-point pen)

Roll No.

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Roll No. (Write the digits in words)

Serial No. of OMR Answer Sheet

Day and Date

(Signature of Invigilator)

INSTRUCTIONS TO CANDIDATES

(Use only *blue/black ball-point pen* in the space above and on both sides of the **Answer Sheet**)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope*.
3. *A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*
4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.
5. *On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.*
6. *No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Question Booklet.*
7. *Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.*
8. *Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.*
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit only **OMR Answer Sheet** at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages : 40

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण पृष्ठ पर दिये गए हैं।]

15P/297/4

ROUGH WORK
रफ़ कार्य

15P/297/4

No. of Questions : 150

प्रश्नों की संख्या : 150

Time : $2\frac{1}{2}$ Hours

Full Marks : 450

समय : $2\frac{1}{2}$ घण्टे

पूर्णाङ्क : 450

Note : (1) Attempt as many questions as you can. Each question carries **3 (Three)** marks. **One mark will be deducted for each incorrect answer. Zero** mark will be awarded for each unattempted question.

अधिकाधिक प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक प्रश्न **3 (तीन)** अंकों का है। **प्रत्येक गलत उत्तर के लिए एक अंक काटा जायेगा।** प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक **शून्य** होगा।

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

यदि एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

1. Which of the following pair (A, B) of events is mutually exclusive, in the random experiment of tossing of a coin four times ?

- (1) A: Obtaining at least two heads, B: Obtaining at most two tails.
- (2) A: Obtaining at least two heads, B: Obtaining at least two tails.
- (3) A: Obtaining at least three heads, B: Obtaining at most three tails.
- (4) A: Obtaining at least three heads, B: Obtaining at least three tails.

2. There are five applicants for a job. The applicants are ranked from best to the worst but it is unknown to the employer. He randomly selects two applicants. Which of the following has higher probability of selection than others, if selected candidates consist of :
- (1) The worst and one of the two best.
 - (2) At least one of the two best.
 - (3) Best and one of the two worst.
 - (4) None of the two best.
3. Read the following statements :
- S1: Classical definition of probability sometimes fails to provide the measure of probability even when the sample space (space of outcomes) is discrete and finite.
- S2: Statistical definition only provides a frequentist's interpretation of probability.
- Choose the most appropriate answer from the following codes :
- (1) Both S1 and S2 are correct.
 - (2) S1 is correct but S2 is incorrect.
 - (3) S1 is incorrect but S2 is correct.
 - (4) Neither S1 nor S2 are correct.
4. An unbiased coin is tossed until a head is obtained or the total number of tosses becomes 7. An event 'A' is defined as 'The coin is tossed at least 3 times'. In this context read the following statements carefully :
- S1: The total number of mutually exclusive and exhaustive outcomes is 8.
- S2: The number of outcomes favourable to the event A is 3.
- Choose the correct answer from the following codes :
- (1) Both S1 and S2 are correct.
 - (2) S1 is correct but S2 is incorrect.
 - (3) S1 is incorrect but S2 is correct.
 - (4) Neither S1 nor S2 are correct.

5. An unbiased coin is tossed until a head is obtained or the total number of tosses becomes 7. An event 'A' is defined as 'The coin is tossed at least 3 times'. In this context read the following statements carefully:
S1: The number of outcomes favourable to the event A is 5.
S2: The probability of happening of the event A is $\frac{5}{8}$.
Choose the correct answer from the following codes :
- (1) Both S1 and S2 are correct.
 - (2) S1 is correct but S2 is incorrect.
 - (3) S1 is incorrect but S2 is correct.
 - (4) Neither S1 nor S2 are correct.
6. In an examination the percentage of male and female candidates are 60 and 40 respectively. If 80 percent of the students have passed the examination, the percentage of females passing the examination is at least :
- (1) 20 percent. (2) 50 percent. (3) 80 percent. (4) 100 percent.
7. In an examination the percentage of male and female candidates are 60 and 40 respectively. It is known that 80 percent of the students have passed the examination. Then the least percentage of males passing the examination is :
- (1) More than the least percentage of females passing the examination.
 - (2) Less than the least percentage of females passing the examination.
 - (3) Equal to the least percentage of females passing the examination.
 - (4) Not comparable the least percentage of females passing the examination, on the basis of the given data only.
8. In a university the male and female students' ratio is 2:3. Half of the male and one third of the female students are non-vegetarian. If a student is selected at random and found to be non-vegetarian, the probability of its being female is :
- | | |
|-----------------------------|-----------------------------|
| (1) $\frac{1}{2}$ | (2) $\frac{1}{3}$ |
| (3) Less than $\frac{1}{3}$ | (4) More than $\frac{1}{2}$ |

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9. There are three bags, each containing 12 white and 8 black balls. One ball is drawn from first bag and placed in the second bag. Then a ball is drawn from the second and placed in the third bag. A ball is then drawn from the third bag. The probability that the ball drawn is white is :

(1) $12/21$ (2) $13/21$ (3) $12/20$ (4) $13/20$

10. A and B are two events. \bar{A} and \bar{B} denote the compliment of A and B respectively. The event C denotes the happening of exactly one out of A and B.

$$S1 : C = (A \cap \bar{B}) \cup (\bar{A} \cap B)$$

$$S2 : C = (A \cup B) \cap (\bar{A} \cup \bar{B})$$

$$S3 : P(C) = P(A) + P(B) - 2P(A \cap B)$$

- (1) Only S1 and S2 are true. (2) Only S2 and S3 are true.
(3) Only S1 and S3 are true. (4) S1, S2 and S3 all are true

11. Five sticks of length 1, 3, 5, 7 and 9 meters are given. Three are selected at random. The probability that selected sticks can form a triangle is :

(1) $1/10$ (2) $2/10$ (3) $3/10$ (4) $4/10$

12. In a multiple choice test, an examinee either knows the answer with probability p or guesses it with probability $1-p$. The probability of answering the question correctly is $1/m$, if he knows the answer and $1/m$ if he guesses the answer. An examinee answer a question correctly, then the probability that he really knows the answer is :

(1) $mp/(1+mp)$. (2) $mp/[1+(m-1)p]$.
(3) $(m-1)p/(1+mp)$. (4) $(m-1)p/[1+m-1)p]$.

13. Three rooms in a hostel are vacant. Three students were asked to submit their preferences for room allotment. Probability that all the three gave the same room as their first preference is :

- (1) $1/27$ (2) $19/27$ (3) $15/27$ (4) $3/27$

14. Two friends X and Y decide to meet at the gate of a hotel for dinner between 20:30 hours and 21:30 hours. They further decide to wait for the other not more than fifteen minutes or beyond the meeting time. Define the events as follows:

A : They had the dinner together. B : X arrives before Y. C : Y arrives before X. Which of the following statements are true?

S1: B and C are equally likely.

S2: B given A and C given A are equally likely.

S3: A given B and A given C are equally likely.

Choose the answer from the following codes:

- (1) Only S1 is true. (2) Only S2 and S3 are true.
 (3) Only S1 and S3 are true. (4) S1, S2 and S3 all are true.

15. $\{X_n\}$ is a sequence of identically and independently distributed random variables with finite fourth central moment. Then the sequence $\{X_n\}$

- (1) Obeys weak law of large numbers only.
 (2) Obeys strong law of large numbers only.
 (3) Obeys both weak law and strong law of large numbers.
 (4) May or may not obey any law of large numbers.

16. $\{X_n\}$ is a sequence of identically and independently distributed random variables with finite second central moment only. Then the sequence $\{X_n\}$
- (1) Always obeys weak law of large numbers only.
 - (2) Always obeys strong law of large numbers only.
 - (3) May obey weak law of large numbers but never strong law of large numbers.
 - (4) May obey strong law of large numbers but never weak law of large numbers.

17. The heights (in nearest centimeters) of a sample of ten people are: 67 73 70 60 67 66 68 71 70 67. Which of the following columns (out of (a), (b) and (c)) show the correct class limits?

Frequency	(a)	(b)	(c)
1	60.5-63.5	60-62	59.5-62.5
0	63.5-66.5	63-65	62.5-65.5
5	66.5-69.5	66-68	65.5-68.5
3	69.5-72.5	69-71	68.5-71.5
1	72.5-75.5	72-74	71.5-74.5

- (1) Column (a) and (b)
 - (2) Column (b) and (c)
 - (3) Column (a) and (c)
 - (4) All the three columns.
18. Prof Rajesh's biology class had a standard deviation of 2.4 on a standardized test, while Prof Mahesh's biology had a standard deviation of 1.2 on the same test. What can be said about these two classes?
- (1) Prof. Rajesh's class is more homogeneous than Prof. Mahesh's.
 - (2) Prof. Mahesh's class is less heterogeneous than Prof. Rajesh's.
 - (3) Prof. Mahesh's class did less well on the test than Prof. Rajesh's.
 - (4) Prof. Rajesh's class performed twice as well on the test as Prof. Mahesh's.

19. In a frequency distribution of 250 scores, the mean is reported as 78 and the median as 65. The distribution is
- (1) Positively skewed. (2) Negatively skewed.
(3) Binomial. (4) Negative binomial
20. The measure of central tendency which is sensitive to extreme scores on the higher or lower end of a distribution is
- (1) Median. (2) Mean.
(3) Mode. (4) all of the above
21. The statistic defined as the distance between 70th sample percentile and 30th sample percentile gives us the information concerning
- (1) Central tendency (2) Dispersion
(3) Skewness (4) Kurtosis
22. Increasing the frequencies in the tails of a distribution will:
- (1) Reduce the standard deviation.
(2) Not affect the standard deviation.
(3) Increase the standard deviation.
(4) Not affect the standard deviation as long as the increases are balanced on each side of the mean.
23. A reading test with maximum scores 50 yields a bell-shaped symmetrical distribution with scores ranging from 5 to 48 on a large sample of class III student. If the same test is administered to class V students, the frequency distribution is expected to be ?
- (1) Positively skewed
(2) Negatively skewed.
(3) Symmetrical and bell-shaped.
(4) Symmetrical and bath tub shape.

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- 24.** A percentile score of 40 in a test of total marks of 300, indicates that a person
- (1) Answered 40% of the questions correctly of that test.
 - (2) Knows 40% of the total topics covered in the test.
 - (3) Has earned a score equal to or more than 120.
 - (4) Has earned a score equal to or better than 40% of the persons who appeared in the test.
- 25.** In designing an experiment, blocking is used
- (1) To reduce bias
 - (2) To reduce variation
 - (3) As a substitute for a control group.
 - (4) As a first step in randomization.
- 26.** Which of the following are true?
- I : Blocking is to design of experiment as stratification is to sampling design.
- II: By controlling certain variables, blocking in design of experiment can make conclusions more specific.
- III: The paired comparison design is a special case of blocking.
- Choose your answer from the following codes
- (1) I and II (2) I and III (3) II and III (4) I, II, and III.
- 27.** Simpsons 1/3 rd rule is obtained by taking $n = \dots\dots\dots$ in the general quadrature formula. Fill up the above blank from one of the following:
- (1) 1. (2) 2. (3) 3. (4) 4.

28. Operations Research approach is typically based on the use of
- (1) Physical model (2) Mathematical model
 (3) Iconic model (4) Descriptive model
29. In a 2^3 - factorial experiment Under usual notation, the effect total [A] is given by
- (1) $(1)+(a)-(b)+(ab)+(c)+(ac)-(bc)+(abc)$
 (2) $-(1)-(a)-(b)-(ab)+(c)+(ac)+(bc)+(abc)$
 (3) $-(1)+(a)-(b)+(ab)-(c)+(ac)-(bc)+(abc)$
 (4) $-(1)-(a)-(b)+(ab)+(c)+(ac)-(bc)+(abc)$
30. If $E(x) = 0$ and $V(x) = 2$ then for any $C > 0$, the upper bound for $P\{|x| \geq C\}$ will be:
- (1) $\frac{4}{c^2}$ (2) $\frac{2}{c^2}$ (3) $\frac{c^2}{4}$ (4) $\frac{c^2}{2}$
31. If X is a Poisson variate with parameter 3, then $E(X^2)$ will be :
- (1) 3 (2) 9 (3) 12 (4) 27
32. If μ_r is the r^{th} central moment of X and $Y = a + bX$ where $b \neq 0$, then r^{th} central moment of Y is:
- (1) μ_r (2) $a + b\mu_r$ (3) $b\mu_r$ (4) $b^r\mu_r$

33. If the probability density function of X is

$$f(x) = \frac{1}{\pi(1+x^2)}; \quad -\infty < x < \infty$$

what is the distribution of X^2 :

- (1) N(0,1) distribution (2) t(1) distribution
(3) χ^2 distribution; (4) F(1,1) distribution
34. Variance of t- distribution with n degree of freedom is finite when:
(1) $n = 1$ (2) $1 < n < \infty$ (3) $1 \leq n < \infty$ (4) $n \geq 3$
35. A rod of length "b" is broken into three parts at random. What is the probability that a triangle can be formed from the parts?
(1) $\frac{1}{4}$ (2) $\frac{1}{8}$ (3) $\frac{1}{64}$ (4) $\frac{1}{32}$
36. Which of the following conditions are necessary for a series to be classifiable as a weakly stationary process?
(i) It must have a constant mean
(ii) It must have a constant variance
(iii) It must have constant auto-covariances for given lags
(iv) It must have a constant probability distribution
- Choose your answer the following codes:
- (1) (ii) and (iv) only (2) (i) and (iii) only
(3) (i), (ii), and (iii) only (4) (i), (ii), (iii) and (iv)

37. In monitoring a phone call you classify the call as a voice call (V) if someone is speaking, otherwise a data call (D) if the call is carrying a modem or fax signal. Classify the call as long (L) if the call lasts for more than three minutes; otherwise classify the call as brief (B). Use the probability model: $P[V] = 0.7$, $P[L] = 0.6$, $P[V \cap L] = 0.35$. The probability $P[D \mid L]$ is then closest to:
- (1) 0.65 (2) 0.42 (3) 0.38 (4) 0.35
38. A student is selected from a class, consisting of 80% male and 20% female, randomly. A question was given to the selected candidate to solve it. The probability that it will be solved correctly is 0.15 if the selected candidate is male and 0.25 if the selected candidate is female. Finally it was noted that the question was solved correctly, then the probability that the selected candidate was male is closest to:
- (1) 0.86 (2) 0.70 (3) 0.125 (4) 0.12
39. A random experiment consists of tossing of three fair (6-sided) die number (X, Y, Z) facing up. $P[\min(X, Y, Z) < 4]$ is closest to:
- (1) $7/8$ (2) $19/27$ (3) $26/27$ (4) $1/8$
40. Let U_1, U_2, U_3 be independent identically distributed standard normal variables. If $X = U_1$, $Y = U_1 + U_2$ and $Z = U_1 + U_2 + U_3$, the $\text{Cov}(Y, Z)$ is closest to:
- (1) 1 (2) 2 (3) 3 (4) 4

41. The joint CDF of a pair of random variables $X = (X, Y)$ is given by:

$$F_{X,Y}(x,y) = \begin{cases} 0 & x < 0, y < 0 \\ xy & 1 \geq x \geq 0, 1 \geq y \geq 0 \\ x & 1 \geq x \geq 0, y > 1 \\ y & x > 1, 1 \geq y \geq 0 \\ 1 & x \geq 1, y \geq 1 \end{cases}$$

The probability that the $\text{Max}(X, Y) \leq 0.6$ is closest to:

- (1) 0.36 (2) 0.5 (3) 0.8 (4) 0.4
42. A quiz consists of 100 multiple choice questions, each with five possible answers, only one of which is correct. If the student guesses on each question, then the average number of questions answered incorrectly by the student is
- (1) 50 (2) 60 (3) 20 (4) 80
43. In the past, the mean running time for a certain type of radio battery has been 9.6 hours. The manufacturer has introduced a change in the production method and wants to perform a test of hypothesis to determine whether the mean running time has changed as a result. The null (H_0) and alternative (H_1) hypotheses should be
- (1) $H_0 : \mu = 9.6$ hours; $H_1 : \mu < 9.6$ hours
 (2) $H_0 : \mu = 9.6$ hours; $H_1 : \mu > 9.6$ hours
 (3) $H_0 : \mu = 9.6$ hours; $H_1 : \mu \neq 9.6$ hours
 (4) any one of the above
44. There are two coins A and B. The probability of getting head on A is 0.4 and on B is 0.6. An experiment is designed to toss each coin 100 times and record the total number of heads (X) obtained in these 200 tosses. If the experiment is repeated 5000 times. The mean and variance of the X would be
- (1) 100, 24 (2) 200, 24 (3) 200, 48 (4) 100, 48

45. Let X_1, X_2, \dots, X_n be IID standard normal variables and let $T_n = (x_1^2 + x_2^2 + \dots + x_n^2)/n$

- (1) The limiting distribution of $T_n - 1$ is Chi-square with 1 degree of freedom.
- (2) The limiting distribution of $\sqrt{n}(T_n - 1)$ is Chi-square with 1 degree of freedom.
- (3) The limiting distribution of $\sqrt{n}(T_n - 1)$ is normal with mean zero and variance 2.
- (4) The limiting distribution of $(T_n - 1)/\sqrt{n}$ is $N(0, \text{var} = 2)$.

46. Two persons, A and B draw random samples of sizes 15 and 20, respectively from normal populations with unknown mean and unknown variances. They wish to test that the mean of the population from which samples have been selected is equal to 2 against the hypothesis that it is greater than 2. Interestingly they found that the sample mean and sample standard deviation of their samples were equal say m and s respectively. Both of them used the usual t-test and calculated the p-value which was obtained by A as P_A and by B as p_B . Then

- (1) $P_A > p_B$ if $s > 1$ and $p_A < p_B$ if $s < 1$
- (2) $P_A = p_B$
- (3) $P_A < p_B$
- (4) $P_A > p_B$

47. What does the total sum of squares in the regression analysis describes?

- (1) Unexplained variability in the response variable.
- (2) Explained variability in the response variable.
- (3) Total variability in the independent variable.
- (4) Total variability in the response variable.

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48. At a stop sign, some drivers come to a full stop, some come to a 'rolling stop' (not a full stop, but slow down), and some do not stop at all. We would like to test if there is an association between gender and type of stop (full, rolling, or no stop). We collected data by standing a few feet from a stop sign and taking note of type of stop and the gender of the driver. Below is a contingency table, summarizing the data we collected.

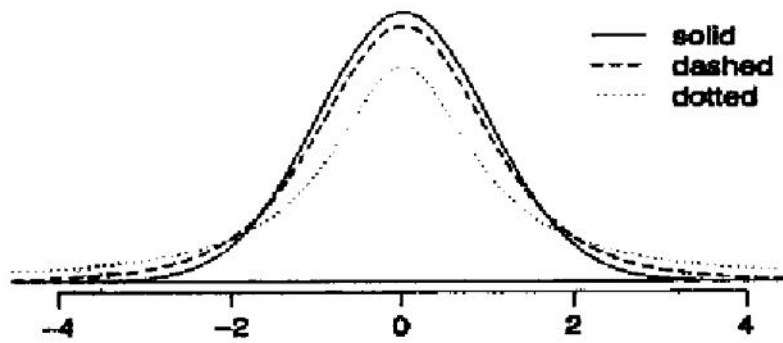
		Gender	
		Male	Female
Stop	Full Stop	6	6
	Rolling stop	16	15
	No stop	4	3

If gender is not associated with type of stop, what percentage of males do we expect who do not stop at all? Choose the closest answer from the following codes:

- (1) 14 (2) 3 (3) 6 (4) 33.6
49. Which of the following is most useful for checking the equal variance across groups for ANOVA?
- (1) Side-by-side box plots showing roughly equally sized boxes for each group.
 - (2) Histograms suggesting nearly normal distributions of data in each group.
 - (3) Summary statistics suggesting that the means of each group are roughly equal.
 - (4) Summary statistics suggesting roughly equal ranges for each group.

50. A study compared five different methods for teaching descriptive statistics. The five methods were traditional lecture and discussion, programmed textbook instruction, programmed text with lectures, computer instruction and computer instruction with lectures. 45 students were randomly assigned, 9 to each method. After completing the course, students took a 1-hour exam. Which of the following is the correct degrees of freedom for an F-test for evaluating if the average test scores are different for the different teaching methods?
- (1) (5, 45) (2) (5, 44) (3) (4, 44) (4) (4, 40)

51. The figure given below shows three t-distribution curves. Which curve has the highest degree of freedom?



- (1) Solid (2) Dashed (3) Dotted (4) None of these
52. To investigate the difference in brain sizes between the citizens of two countries, random samples of brain sizes from both countries were collected. At the 5% significance level the study failed to reject the null hypothesis that the citizens of the two countries have (on average) brains of equal size. Which of the following is then true regarding a 99% confidence interval for the difference in brain sizes?
- (1) The interval should always contain 0.
 (2) The interval should never contain 0.
 (3) Without more information, it is impossible to tell whether the interval contains 0 or not
 (4) 99% confidence interval for the difference in brain sizes can not be constructed.

53. Read the following statements carefully in context of the function given below :

$$\begin{aligned}
 F(x) &= 0, && \text{if } x < 0 \\
 &= 3c^2, && \text{if } 0 \leq x < 1 \\
 &= 4c - 7c^2, && \text{if } 1 \leq x < 2 \\
 &= 9c - 7c^2 - 1, && \text{if } 2 \leq x < 3 \\
 &= 1, && \text{if } 3 \leq x.
 \end{aligned}$$

Assertion(A): $F(x)$ can be cumulative distribution function of a continuous positive random variable for properly chosen value of 'c'.

Reason(R): For proper choice of 'c', $F(x)$ is monotone and bounded between 0 and 1. Select your answer from the following codes:

- (1) Both A and R is true and R is correct explanation of A.
 - (2) Both A and R is true but R is not correct explanation of A.
 - (3) A is true but R is false.
 - (4) A is false but R is true
54. A non-negative integer valued random variable takes value k with probability proportional to a^k ($0 < a < 1$) and $F(x)$ denotes its cumulative distribution function, then $F(1)$ is equal to
- (1) a (2) $1-a$ (3) $a(1-a)$ (4) $1-a^2$

55. The probability mass function of a random variable X is given below:

$$\begin{aligned}
 f(x) &= x/15; && x = 1, 2, 3, 4, 5 \\
 &= 0; && \text{otherwise}
 \end{aligned}$$

Then the conditional probability that X lies between $1/2$ and $5/2$ given that X is greater than 1 is

- (1) $1/7$ (2) $3/7$ (3) $2/15$ (4) $1/5$

56. The marks obtained by a group of students are available in two examinations. First one was held before an extensive coaching and second one after the coaching. It is known that marks are normally distributed. Even then

Statement(S): We should use sign test in place of paired t-test.

Reason(R): Sign test is more powerful than paired t-test.

- (1) S is true and R is its correct explanation.
- (2) S is true but R is not its correct explanation.
- (3) S is false but R is true.
- (4) Both S and R are false

57. Consider the problem of test of goodness of fit and choose the best from the following in this context:

- (1) Kolmogrov-Smirnov (K-S) test is the only non parametric test.
- (2) There exists no parametric test if measurements are nominal.
- (3) Chi-square test is an alternative to K-S test.
- (4) Chi-square test is more powerful than K-S test.

58. An exhaustive list of all members of the population along with their identification particulars is called

- | | |
|------------------------|----------------------|
| (1) Sampling design. | (2) Sampling frame. |
| (3) Population design. | (4) Population frame |

59. The t-distribution with one degree of freedom is equivalent to:

- (1) Cauchy's distribution.
- (2) Beta distribution of first kind.
- (3) Beta distribution of second kind.
- (4) Normal distribution.

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60. In a two way classification with one observation per cell, there are 4 rows and 3 columns. The degrees of freedom for the error mean squares is
- (1) 11 (2) 8 (3) 6 (4) 3
61. A sample of size 25 is drawn from a population of size 1000 using simple random sampling without replacement method. The probability that the unit bearing serial number 786 will be selected in the sample at 20 the draw is
- (1) .001 (2) .04 (3) .020 (4) .025
62. In sample surveys, we can control the following to its minimum level;
- (1) Only sampling error.
(2) Only non-sampling error.
(3) Total of sampling and non-sampling errors.
(4) Neither sampling nor non-sampling error.
63. Read the following statements carefully:
- S_1 : Systematic sampling is partly probabilistic and partly non-probabilistic.
 S_2 : Systematic sampling provides unbiased estimates if there are some periodic feature in the list of units.
- Choose the correct answer from the following:
- (1) Both S_1 and S_2 are true. (2) S_1 is true but S_2 is false.
(3) S_1 is false but S_2 is true. (4) Both S_1 and S_2 are false.

64. Neyman-Pearson fundamental lemma gives the most powerful test for:

- (1) Simple null hypothesis against composite alternative hypothesis.
- (2) Composite null hypothesis against Simple alternative hypothesis.
- (3) Simple null hypothesis against simple alternative hypothesis.
- (4) Composite null hypothesis against composite alternative hypothesis.

65. The ratio method of estimation provides more efficient estimator than ordinary mean when samples are drawn by using the method of simple random sampling without replacement provided:

- (1) The regression of main characteristics on auxiliary characteristics should be linear and it must pass through origin.
- (2) The regression of main characteristics on auxiliary characteristics should be linear but it may not pass through origin.
- (3) The regression of main characteristics on auxiliary characteristics may be non linear but it should pass through origin.
- (4) The regression of main characteristics on auxiliary characteristics may not be linear and may not pass through origin

66. Let ρ , C_x and C_y denote the correlation coefficient, coefficient of variation of auxiliary characteristics and coefficient of variation of main characteristics respectively. Product moment correlation is always more efficient than sample mean if

- (1) $2\rho C_y > C_x$
- (2) $2\rho C_x > C_y$
- (3) $2\rho C_y < -C_x$
- (4) $2\rho C_x < -C_y$

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67. A population is divided into three strata whose sizes are 24, 36 and 48 respectively. If we wish to draw a sample of size 18 using proportional allocation the number of units to be drawn from third stratum is
(1) 4 (2) 6 (3) 8 (4) 9
68. A Latin Square Design is a
(1) Complete two way layout. (2) Incomplete two way layout.
(3) Complete three way layout. (4) Incomplete three way layout.
69. In a 6x6 Latin Square Design with two missing observations, the error and treatment degrees of freedom are respectively:
(1) 18, 3 (2) 18, 5 (3) 20, 3 (4) 20, 5
70. The following is the layout of one replicate of a 2^3 - factorial experiment:
Block 1 (1) b ac abc
Block 2 a ab c bc
The interaction confounded above is
(1) AB (2) AC (3) BC (4) ABC
71. The responses in a factorial experiment with factors A and B each at two levels with three replications are as follows (in usual notations) :
[1] = 18, [a] = 17, [b] = 25 and [ab] = 30.
The sum of square due to interaction AB is :
(1) 6 (2) 4
(3) 3 (4) None of above.

72. It is proposed to test the null hypothesis $H_0: \theta = 2$ against the alternative hypothesis $H_1: \theta = 1$ on the basis of a single observation X from the population having density function $f(x | \theta) = \theta \exp(-x\theta)$ for $x > 0$ and $\theta > 0$. If the critical region is $X > 1$, the probability of committing Type-I error is :
- (1) e^{-2} (2) e^2 (3) $e^2 - 1$ (4) $(e^2 - 1)^{-1}$
73. When we are sampling from a normal population with unknown mean μ and unknown variance σ^2 , which of the following is a simple hypothesis ?
- (1) $H_0: \mu = 10$. (2) $H_0: \mu = 20, \sigma^2 = 4$
 (3) $H_0: \sigma^2 = 4$. (4) All the three mentioned above.
74. The Cramer-Rao lower bound for the unbiased estimator of θ based on a sample of size n drawn from a population having probability density function :
- $f(x | \theta) = [p\{1+(x-\theta)^2\}]^{-1}$ for $-\infty < x < \infty$ and $-\infty < \theta < \infty$; is
- (1) θ/n (2) $2\theta/n$ (3) $1/n$ (4) $2/n$
75. Let \bar{X} denotes the sample mean of a random sample of size n drawn from normal population $N(\mu, \sigma^2)$. The INCONSISTENT estimator of μ is:
- (1) $\bar{X} + \frac{1}{5n}$ (2) $\frac{n\bar{X} + 10}{n + 50}$
 (3) $\frac{4n^2\bar{X} + 101n + 71}{4n^2 + 819n - 750}$ (4) $\frac{7n^2\bar{X} + 100n + 747}{91n^2 + 18n - 175}$

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76. For a Binomial distribution $B(X | 20, p)$, the variance cannot exceed

- (1) 5. (2) 10.
(3) 20. (4) Nothing definite can be said.

77. X is a standard normal variable. Define :

$$Y = \begin{cases} X & \text{if } |X| \leq 1 \\ -X & \text{if } |X| > 1 \end{cases}$$

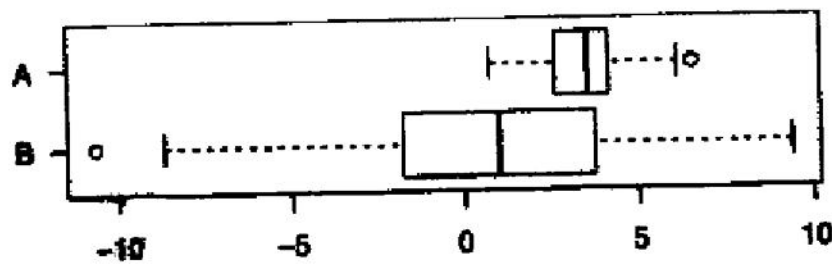
Then the distribution of Y is :

- (1) Uniform over $(0, 1)$
(2) Uniform over $(-1, 1)$
(3) Standard normal
(4) Normal but other than standard normal
78. A random variable X has mean 3 and variance 2. Then $P(1 \leq X \leq 5)$ will be :
- (1) Less than $1/4$ (2) between $1/4$ and $1/2$
(3) between $1/2$ and $3/4$ (4) greater than $3/4$
79. A and B are two events with $A \subset B$ and $P(B) < 1$. If $p_1 = P(A^c \cup B^c)$, $p_2 = P(A^c \cap B^c)$ and $p_3 = P(A^c/B^c)$ then :
- (1) $p_1 \leq p_2 \leq p_3$ (2) $p_1 \leq p_3 \leq p_2$
(3) $p_2 \leq p_1 \leq p_3$ (4) $p_2 \leq p_3 \leq p_1$

80. For a political science class, it is required to get opinion on free primary education of members of a particular party from a town. The town is divided into 17 blocks, each with similar socio-economic status distribution and other diversities. Rather than trying to obtain a list of all members of that party of the town. It is decided to select 3 blocks at random, using simple random sampling without replacement. For selected blocks, the list of all current members of the party will be collected from the block office of the party. Then the opinion on free primary education of the members was collected. What kind of design has been used above ?

- (1) simple random sampling (2) stratified sampling
 (3) systematic sampling (4) cluster sampling

81. Two distributions (A and B) are shown on the box plot below. Which of the following statements is not supported by the plot ?



- (1) Both distributions are unimodal.
 (2) Median of A is higher than median of B.
 (3) Both distributions are roughly symmetric.
 (4) B is more variable than A.
82. What is the objective function in linear programming problems ?
- (1) A constraint for available resource.
 (2) A set of linear conditions in the variable resources.
 (3) A linear function in the variable resources to be optimized.
 (4) Any convex function of the variables to be optimized.

83. Maximize $z = 2x + 7y$ subject to

$$3x - 2y \leq 1$$

$$-x + 3y \geq -1$$

for non-negative x and y . Which of the following points are feasible: $A(0,0)$, $B(1,1)$, $C(2,2)$?

(1) A and B only

(2) A and C only

(3) B and C only

(4) A, B and C.

84. Let a random variable X assume the values 0 and 1 with probabilities θ and $(1-\theta)$ respectively, $\frac{1}{2} \leq \theta \leq 1$. Then, what is the maximum likelihood estimator of θ on the basis of a single observation X ?

(1) $(1+X)$

(2) $(2-X)/2$

(3) $(2+X)/2$

(4) $(1-X)$

85. In randomized block design with k treatments and two blocks with mean B_1 and B_2 , which one of the following is the correct sum of the squares due to blocks?

(1) $(B_1 - B_2)^2/k$

(2) $(B_1 - B_2)^2/2k$

(3) $K(B_1 - B_2)^2/2$

(4) $(B_1 - B_2)^2/2$

86. Given the ultimate class frequencies $(AB) = 250$, $(A\bar{B}) = 120$, $(\bar{a}B) = 200$ and $(\bar{a}\bar{b}) = 70$, then (a) and (β) are

(1) 450 and 370

(2) 370 and 450

(3) 270 and 190

(4) 190 and 270.

87. Cluster sampling is better than the simple random sampling if the intra- class correlation coefficient is :
- (1) Positive (2) Negative (3) One (4) Zero.

Questions 88 to 90 refer to the following research situation :

A researcher who wanted to determine the benefits of using a new beginning algebra study technique obtained permission from the school of a district to select students. The researcher prepared a list of all beginning algebra students of that school and selected 50 out of them at random. The researcher divided the students randomly into two groups each consisting of 25 students. One group participated in the new study program and the other group was trained through the traditional study techniques.

88. The most likely target population in this study is :
- (1) Algebra students of the district to which the school belong.
(2) All algebra students of that school only.
(3) All algebra students.
(4) Only the 25 students who learned the new study techniques.
89. The method of sampling used in the study is :
- (1) Simple random sampling. (2) Stratified random sampling.
(3) Cluster sampling. (4) Convenience sampling
90. The greatest weakness of this study is :
- (1) The division of the sample into two groups of 25.
(2) The use of only 50 students in the sample.
(3) The use of students from only one school.
(4) The use of only two different study techniques.

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91. If a series, y , follows a random walk, what is the optimal one-step ahead forecast of y ?
- (1) The current value of y
 - (2) Zero
 - (3) One
 - (4) The average value of y over the in-sample period
92. Which of the following behaviors will be exhibited by the data for last 50 years of yearly average price of wheat ?
- (1) Trend only
 - (2) Cyclic variation only
 - (3) Trend and cycle variation
 - (4) Trend, cyclic and random variation.
93. Which of the following smoothing constants would make an exponential smoothing forecast equivalent to a naive forecast ?
- | | |
|---------|--|
| (1) 0 | (2) 1 divided by the number of periods |
| (3) 0.5 | (4) 1.0 |
94. The percent of variation in the dependent variable that is explained by the regression equation (independent variable) is measured by the
- | | |
|----------------------------------|-----------------------------|
| (1) Mean absolute deviation | (2) Slope |
| (3) Coefficient of determination | (4) Correlation coefficient |
95. The ratio of a new price to the base year price is called the :
- | | |
|--------------------|--------------------|
| (1) Price decrease | (2) Price relative |
| (3) Price increase | (4) Price absolute |

96. A simple aggregate price index :
- (1) Ignores relative quantities
 - (2) Considers relative quantities
 - (3) Compares absolute prices to absolute quantities
 - (4) Compares relative quantities to relative prices
97. The Laspeyres and Paasche index are examples of :
- (1) Aggregate index numbers
 - (2) Weighted price index only
 - (3) Weighted index numbers
 - (4) Weighted quantity index only
98. In usual notations, the formula $\frac{S P_0 Q_1}{S P_1 Q_0} \times 100$ is used to calculate :
- (1) The Laspeyres price index
 - (2) The Paasche price index
 - (3) The Paasche quantity index
 - (4) The Laspeyres quantity index
99. A scaling factor is used to :
- (1) Change a simple index to a weighted index
 - (2) Change an aggregate index to a weighted index
 - (3) Change the base year
 - (4) Convert the Paasche index to a Laspeyres index.
100. If the Net reproduction rate is equal to 'one' then the population will have a tendency :
- (1) To decrease in size
 - (2) To increase in size
 - (3) To remain constant in size
 - (4) To have the same age structure.
101. Which of the following is the most popular way of representing the population structure of a specified region ?
- (1) Vertical bar chart
 - (2) Divided bar chart
 - (3) Population pyramid
 - (4) Population histogram

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102. Records of births, deaths, marriages and divorces, gathered through a registration system maintained by governmental units, are referred to as :
- (1) A census. (2) Demographic data.
(3) Vital statistics. (4) Sociological data.
103. Which one of the following is correct (notations carry their usual meanings) ?
- (1) $d_x = l_x + l_{x+1}$ (2) $d_x = q_x l_x$
(3) $d_x = q_{x+1} + l_x$ (4) $d_x = q_x + l_{x+1}$.
104. Which one of the following is correct (notations carry their usual meanings) ?
- (1) $L_x = l_{x+1/2}$ (2) $L_x = l_{x+1} / 2 + l_x$
(3) $L_x = 1/2 (l_x + l_{x+1})$ (4) $L_x = \sqrt{l_x l_{x+1}}$
105. Age specific fertility curve is :
- (1) Slightly positively skewed (2) Highly positively skewed
(3) Slightly negatively skewed (4) Highly negatively skewed
106. The extent to which mothers produce female infants who survive to replace them is measure by :
- (1) Total fertility rate (2) Net reproduction rate
(3) Gross reproduction rate (4) Crude birth rate.
107. The Gross reproduction rate (GRR) :
- (1) Provides lower limit to Net Reproduction rate (NRR).
(2) Provides upper limit to NRR.
(3) Has no relationship with NRR.
(4) Does not consider the prevailing mortality .

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115. How many types of memory is used by computers :

- (1) 2 (2) 3 (3) 4 (4) 5

116. The language used for complex scientific computation is :

- (1) Cobol (2) Fortran
(3) HTML (4) None of the above

117. A graphic representation of the sequence of steps needed to solve a programming problem is known as :

- (1) Flowchart (2) Algorithm
(3) Program Graph (4) None the above

118. Which of following is not a basic logic gate in digital system ?

- (1) And (2) Or (3) Not (4) Nand

119. Convert $(100011)_2$ into its decimal equivalent :

- (1) $(35)_{10}$ (2) $(37)_{10}$ (3) $(17)_{10}$ (4) $(32)_{10}$

120. When you copy or cut information it get placed in :

- (1) Clipboard (2) Clipart (3) Motherboard (4) Hard disk

121. The acronym DBMS stands for :

- (1) Data Base Management System
(2) Data binder Management System
(3) Data Base methodology System
(4) Decimal and Binary Mathematical System

122. Each Box in Excel Spread Sheet is called :

- (a) Cell (b) Table (c) Record (d) Box

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127. Which of Following is not an object oriented Programming Language?

- (1) C (2) C++ (3) JAVA (4) R

128. Which of following is not a Statistical Package ?

- (1) SPSS (2) SAS (3) STATA (4) C

129. Which of Following is not an operating System ?

- (1) DOS (2) LINUX (3) Windows (4) ALGOL

130. In which generation of computer development, "micro processor chip" is used as a principal component ?

- (1) 1st (2) 2nd (3) 3rd (4) 4th

131. What is "KIPS" in computer terminology ?

- (1) Knowledge Information Processor System
(2) Knowledge Information Protection System
(3) Knowledge Information Processing System
(4) Knowledge Introducing Protection System

132. Which of the following is not the work of "output interfaces" ?

- (1) Conversion of the coded results to human acceptable form.
(2) Shifting of the memory from RAM to CPU.
(3) Supply of the converted results to the outside world.
(4) Acceptance of the results produced by the computers which are not in coded form

133. What is the correct expression for $(1AF)_{16}$?

- (1) $(217)_{10}$ (2) $(431)_{10}$
(3) $(437)_{10}$ (4) $(430)_{10}$

134. What is "ASCII" ?

- (1) American Scientific code for International Institute
- (2) American Standard code for International Information
- (3) American Standard code for International Interchange
- (4) American Standard code for Information Interchange

135. Which of the following is the valid "integer constant" in FORTRAN ?

- (1) 11.
- (2) -374
- (3) \$125
- (4) 123,45

136. Which of the following is invalid "real constant" in FORTRAN ?

- (1) 467000.
- (2) -.0025
- (3) 58,48.34
- (4) 1.5

137. In FORTRAN what will be the correct representation for 457000 ?

- (1) .46x10⁶
- (2) 45.7x10³
- (3) .45E6
- (4) .45E-6

138. Which of the following is valid in FORTRAN ?

- (1) 146.86E+27
- (2) 125*E9
- (3) +142.7E
- (4) 123,45E-6

139. In FORTRAN which of the following is invalid "Integer variable" ?

- (1) BAT2
- (2) INKPOT
- (3) MAS2
- (4) KITE4

140. Which of the following is valid "real variable" in FORTRAN ?

- (1) PRAVEEN
- (2) SIGMA.
- (3) LION
- (4) C

141. What is the correct expression for, $\log_e \sqrt{\frac{x}{yz}}$

- (1) LOG(SQRT(X/Y*Z))
- (2) LOG(SQRT(X/Y**Z))
- (3) ALOG(SQRT(X/(Y*Z)))
- (4) ALOG(SQRT(X/(Y**Z)))

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142. In C which symbol is used for logical operator NOT ?

- (1) ! (2) \$ (3) & (4) ∅

143. Which of the following is the output function in C ?

- (1) Print("...") (2) Printf("..."); (3) Printf("..."). (4) Scanf("...");

144. Number of keywords available in C are :

- (1) 26 (2) 36 (3) 32 (4) 40

145. Which is not a keyword in C language ?

- (1) double (2) if (3) void (4) type

146. In FORTRAN the symbol b □ is used for ?

- (1) Blank space
(2) NOT operator
(3) Delete command
(4) Showing any interruption during the programe

147. FORTRAN statement are written starting from the :

- (1) 6th column to column 72 (2) 6th column to column 73
(3) 7th column to column 72 (4) 7th column to column 73

148. The product of two binary numbers (1011) and (1001) is :

- (1) 1100011 (2) 1010100 (3) 1011001 (4) 100110

149. Special characters in FORTRAN 77 are :

- (a) + (b) \$ (c) : (d) % (e) blank

Choose your answer from the following codes :

- (1) (a), (b), (c), (d) (2) (a), (c), (d), (e)
(3) (a), (b), (c), (e) (4) (b), (c), (d), (e)

150. The default MS Excel file extension is :

- (1) .XLR (2) .EXE (3) .EXL (4) .XLS

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ROUGH WORK
रफ़ कार्य

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ROUGH WORK
रफ़ कार्य

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली-काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।
2. परीक्षा भवन में लिफाफा रहित प्रवेश-पत्र के अतिरिक्त, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।
4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।
5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।
6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।
7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।
8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिए आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।
9. प्रत्येक प्रश्न के उत्तर के लिए केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।
10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
11. रफ कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ओ एम आर उत्तर-पत्र परीक्षा भवन में जमा कर दें।
13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।