

Set No. : 1

Question Booklet No.

RET/15/TEST-B

31

666

Health Statistics

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

Roll No.

--	--	--	--	--	--	--	--	--

Roll No. (Write the digits in words) .....

Serial No. of OMR Answer Sheet .....

Day and Date .....

o

( 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, Please ensure that you have got the correct booklet and it contains all the pages in correct sequence and 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.*
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. *This Booklet contains 40 multiple choice questions followed by 10 short answer questions. For each MCQ, 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. For answering any five short Answer Questions use five Blank pages attached at the end of this Question Booklet.*
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 pages of the title cover and the blank page at the end of this Booklet.
12. *Deposit both OMR Answer Sheet and Question Booklet 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 : 20**

666/Health Statistics

**ROUGH WORK**

## No. of Questions : 50

Time : 2 Hours

Full Marks : 200

- Note: (1)** This Question Booklet contains **40** Multiple Choice Questions followed by **10** Short Answer Questions.
- (2)** Attempt as many MCQs as you can. Each MCQ carries **3 (Three)** marks. **1 (One)** mark will be deducted for each incorrect answer. **Zero** mark will be awarded for each unattempted question. If more than one alternative answers of MCQs seem to be approximate to the correct answer, choose the closest one.
- (3)** Answer only **5** Short Answer Questions. Each question carries **16 (Sixteen)** marks and should be answered in **150-200** words. Blank **5 (Five)** pages attached with this booklet shall only be used for the purpose. Answer each question on separate page, after writing Question No.

**01.** Which of the following is pluripotent cell

- |                    |                      |
|--------------------|----------------------|
| (1) Stem cell      | (2) Sertoli cells    |
| (3) Memory t cells | (4) Langerhans cells |

**02.** Which of the following is NOT a lymphoid organ

- |                |             |
|----------------|-------------|
| (1) Lymphnodes | (2) Tonsils |
| (3) Thyroid    | (4) Spleen  |

**03.** Enzymes for kreb cycle are located in

- |                  |               |
|------------------|---------------|
| (1) Mitochondria | (2) Cytoplasm |
| (3) Peroxisomes  | (4) Nucleus   |

**04.** Which of the following is a non communicable disease

- |             |                  |
|-------------|------------------|
| (1) HIV     | (2) Tuberculosis |
| (3) Measles | (4) Tetanus      |

**666/Health Statistics**

- 05.** Which of the following is NOT a part of immune system of the body ?
- |                      |                    |
|----------------------|--------------------|
| (1) Langerhans cells | (2) Helper T cells |
| (3) Histiocytes      | (4) Reticulocytes  |
- 06.** Ovulation occurs at
- |   |
|---|
| (1) 5 <sup>th</sup> day of menstrual cycle  |
| (2) 14 <sup>th</sup> day of menstrual cycle |
| (3) 21 <sup>st</sup> day of menstrual cycle |
| (4) 28 <sup>th</sup> day of menstrual cycle |
- 07.** Amount of growth hormone secretion reach its peak by
- |           |           |
|-----------|-----------|
| (1) 8 am  | (2) 8 pm  |
| (3) 12 am | (4) 12 pm |
- 08.** Which of the following is false ?
- |  |
|--|
| (1) Bones are attached to other bones by means of tendon           |
| (2) Bones are attached to muscles by means ligaments               |
| (3) Bones are joined to other bones by mean of articular cartilage |
| (4) Bones are joint to each other by mean of fibrous tissue        |
- 09.** Regulators of thirst and hunger centre is present in
- |                  |              |
|------------------|--------------|
| (1) Medulla      | (2) Midbrain |
| (3) Hypothalamus | (4) Cortex   |
- 10.** Which of the following is NOT included in the stages of embryological development ?
- |                        |                      |
|------------------------|----------------------|
| (1) Insemination       | (2) Gastrulation     |
| (3) Blastula formation | (4) Morula formation |

11. In statistical literature data are broadly classified as interval scale data, ordinal scale data, & categorical data. Blood groups will be an explain for:
- (1) Interval scale data                      (2) Ordinal scale data  
(3) Nominal scale data                      (4) None of the above
12. The study design which deals with risk factor:
- (1) Descriptive                                      (2) Analytical  
(3) Experimental                                      (4) Interventional
13. Type I error is:
- (1) Accepting a null hypothesis  
(2) Accepting a null hypothesis when it is false  
(3) Rejecting a null hypothesis when it is true  
(4) Rejecting a null hypothesis
14. Type II error is :
- (1) Not rejecting a null hypothesis  
(2) Rejecting a null hypothesis when it is true  
(3) Rejecting a null hypothesis  
(4) Accepting alternative when it is false
15. If two samples are drawn from two non Gaussian population, to test that the two populations' distribution is similar or different, one should apply:
- (1) Mann Whitney test                      (2) Unpaired t test  
(3) Wilcoxon sign rant test                      (4) Frienman's test

**666/Health Statistics**

- 16.** In an experiment with three treatments arms and one control, one way ANOVA concluded to reject hypothesis of no difference. The post hoc test followed will be:
- (1) SNK test
  - (2) Dunnett test
  - (3) Boneferroni test
  - (4) None of the above
- 17.** Factorial experiment with 2 factors (A & B) each at 2 levels will evaluate the effect of:
- (1) Main effect of A
  - (2) Main effect of B
  - (3) Interaction effect between A & B
  - (4) All the above
- 18.** In a matched case control study design, the odds ratio is defined as :
- (1) Ratio of number of pairs in which both the cases and controls exposed to the number of pairs in which both the cases and controls unexposed
  - (2) Ratio of number of pairs in which cases exposed and controls unexposed to the number of pairs in which cases unexposed and controls exposed
  - (3) Ratio of number of pairs in which cases exposed and controls unexposed to the number of pairs in which both cases and controls exposed
  - (4) Ratio of number of pairs in which cases exposed and controls unexposed to the number of pairs in which both cases and controls unexposed

- 19.** Mantel Haenszel procedure is adopted to:
- (1) Adjust confounding effect
  - (2) Adjust interaction effect
  - (3) Both confounding and interaction effect
  - (4) None of the above
- 20.** Censored observations are:
- (1) More important than not censored ones in survival analysis
  - (2) Assumed to be normally distributed over time
  - (3) Assumed to have the same survival chances as censored observations
  - (4) Essential to allow calculation of the Kaplan Meier plot
- 21.** A cox regression analysis:
- (1) Is used to analyse survival data when individuals in the study are followed for Varying lengths of time
  - (2) Can only be used when there are censored data
  - (3) Always assumes that the relative hazard for a particular variable is constant at all time.
  - (4) Relies on the assumption that that the explanatory variables in the model are normally distributed.
- 22.** A sample can be defined as a:
- (1) Population of interest to researcher
  - (2) Quota from within the whole population
  - (3) Subset of population representative of the population of interest of the researcher.
  - (4) Criterion used to define eligibility for the research study

**666/Health Statistics**

**23.** A large sample size is required when:

- (1) The population of interest for a study is less diverse
- (2) A low level of precision is required
- (3) The population of interest is easily recruited to the study
- (4) A high level of precision is required

**24.** Lincoln and Guba (1985) propose that an alternative criterion for evaluating qualitative research would be :

- (1) Impressiveness
- (2) Trust worthiness
- (3) Joyfulness
- (4) Messiness

**25.** Cross-cultural studies are an example of:

- (1) Case study design
- (2) Comparative study
- (3) Experimental study design
- (4) Longitudinal study design

**26.** The Variance covariance matrix of a bivariate normal variable  $X = \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$

is  $\begin{bmatrix} a & b \\ b & c \end{bmatrix}$ . For what values of a,b and c the random variable  $X_1+X_2$  and  $X_1-X_2$  are independent ?

- (1)  $a=b$
- (2)  $c=b$
- (3)  $a=c$
- (4)  $a=b=c$



27. Which of the following is not true for a random vector  $X$  having multivariate normal distribution ?
- (1) Linear combinations of the components of  $X$  are normally distributed
  - (2) All subsets of the components of  $X$  have a multivariate normal distribution.
  - (3) Zero covariance does not imply that corresponding components are independent.
  - (4) Zero covariance implies that corresponding components are independent.

28. Let  $X = \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}$  be  $N_3(\mu, \Sigma)$  with  $\mu' = [2 \ -3 \ 1]$  and  $\Sigma = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 3 & 2 \\ 1 & 2 & 2 \end{bmatrix}$

If  $Y = 3X_1 - 2X_2 + X_3$  then  $P(10 \leq Y \leq 16)$  is:

- (1) 0.95
  - (2) 0.68
  - (3) 0.05
  - (4) 0.01
29. A regression analysis having a continuous dependent variable and a set of continuous and categorical independent variable is termed as :
- (1) Analysis of variance
  - (2) Analysis of covariance
  - (3) Probit analysis
  - (4) Logistic regression
30. Which of the following regression model is nonlinear:
- (1)  $Y = \beta_0 + \beta_1^2 X + e$
  - (2)  $Y = \beta_0 + \beta_1 X + \beta_2 X^2 + e$
  - (3)  $Y = \beta_0 + \beta_1 \log(X) + e$
  - (4)  $Y = \beta_0 + \beta_1 \sqrt{X} + e$

**666/Health Statistics**

**31.** There are 7 identical cards in a pack out of which 3 are red and 4 are green. Each red card bears number 1 and each green card bears number 2. A card is chosen at random. After that an unbiased die is being thrown to the same number of times which was written on selected card. Obtain probability of getting exactly one six on die.

- (1)  $\frac{29}{126}$                       (2)  $\frac{18}{126}$                       (3)  $\frac{17}{126}$                       (4)  $\frac{15}{126}$

**32.** Minimax rule of game theory is based on the concept of:

- (1) Each player wants to maximize its best situations
- (2) Each player wants to maximize its worst situations
- (3) Each player wants to minimize its best situations
- (4) Each player wants to minimize its worst situations

**33.** Which of the following is true regarding Bayesian inference ?

- (1) Bayesian method uses repeated samples from population
- (2) Bayesian method uses sampling distribution of estimator
- (3) Bayesian method is direct statement about estimator
- (4) Bayesian method is direct statement about parameter

**34.** Let  $X \sim N(\mu, 4)$  and prior distribution  $g(\mu)$  of  $\mu$  has standard normal distribution then the posterior distribution of  $\mu$  is:

- (1) Beta distribution
- (2) Gamma distribution
- (3) Normal distribution
- (4) Standard normal distribution

**35.** The following does not come under the study of epidemiology

- (1) Unit of study is a defined population
- (2) Unit of study is a clinical case
- (3) Unit of study is population at risk
- (4) It is study of both at risk & healthy

36. An epidemiologist usually does not express disease magnitude as
- (1) Rates
  - (2) Height
  - (3) Ratio
  - (4) Preparation
37. Incident of the disease can be calculated by conduction of
- (1) Cross sectional health checkup
  - (2) Cohort study
  - (3) Case control study
  - (4) Cross sectional study of a village
38. Time distribution of a disease cannot be described by following
- (1) Short term fluctuation
  - (2) Period fluctuation
  - (3) Long term or secular trend
  - (4) By making spot map of disease in a community
39. One of the following is true for the case control study
- (1) Both exposure and outcome (disease) have occurred
  - (2) Follow up of all smokes till they develop lung cancer
  - (3) The study proceeds from cause to effect
  - (4) The study populations are identified prior to appearance of the disease under investigation
40. The following is not a risk factor for non-communicable diseases
- (1) Sufficient physical activity
  - (2) Use of alcohol
  - (3) Raised Cholesterol
  - (4) Consumption of tobacco

**Short Answer Questions**

**Note :** Attempt any **five** questions. Write answer in **150-200** words. Each question carries **16** marks. Answer each question on separate page after writing Question Number.

01. Describe the concept of analysis of co-variance with an example and write the model that is used in analysis.
02. Define parametric and non-parametric tests and write the condition when these are applied ?
03. For the diseases, show by example that exposure rate among non-diseased group is approximately same as in general population. Further, write the formula to determine the sample sizes of equal sizes for cases and controls.
04. If the population consists of a linear trend, then prove that:  
$$\text{Var}(Y_{st}) \leq \text{Var}(Y_{sys})$$
05. Describe a step up method for selection of variables in a Cox P.H. model.
06. Describe the various measures of fertility.
07. Let  $X \sim b(1, \theta)$  and  $g(\theta) = \frac{1}{\sqrt{\theta(1-\theta)}} \quad 0 \leq \theta \leq 1$  obtain Bayes estimator of  $\theta$  under squared error loss and its risk.

08. Let  $N_p(\mu, \Sigma)$  denotes multivariate normal distribution of random vector  $X_{p \times 1}$ . If we define  $Y=CX$ , where  $C$  is a nonsingular matrix then show that  $Y \sim N_p(C\mu, C\Sigma C')$
09. Obtain maximum likelihood estimators of parameters of simple linear regression model.
10. During survey for measurement of blood presume, digital machine should be used, why ?



Question No.

Page for Short Answer

---

Question No.

Page for Short Answer

---



Question No.

Page for Short Answer

---

**Question No.**

**Page for Short Answer**

---

**ROUGH WORK**

## 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।