38. The probility of rejecting a null hypothesis when it is *false* is :

(1) β (2) $\alpha+\beta$ (3) $1-\beta$ (4) $1-\alpha$

39. A basic feasible solution of a system of m equations and n variables ($m < n$) is a solution where :

(1) m variables are non negative and n–m variables zero

(2) n variables are non negative and n–m variables zero

(3) m+1 variables are non negative and n–m–1 variables zero

(4) n–m variables are non negative and m variables zero

40. According to Thomas Malthus, population increases ..... while food supply increases ..... :

(1) Arithmetically, exponentially (2) Geometrically, arithmetically

(3) Instages, based on percentage (4) Fractionally, progressively

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.

SEAL

1. Describe the method of calculation of annual risk of dying.

2. How growth rate and population doubling time is associated with each other ?

3. Explain the cox - proportional hazard model and its advantages over log - rank test.

4. Discuss prognostic Index and its application in medical field.

5. Mention concept of time and state space in stochastic processes.

6. Let $X_1, X_2, \ldots\ldots, X_n$ are random sample from uniform distribution U ($0, \theta$), obtain maximum likelihood estimator of θ and comment on its unbiasedness.

7. Let $X \sim$ Poisson (θ) and prior distribution for θ is Gamma (a, b). Obtain Bayes estimator of under squared error loss function on the basis of a random sample of size n drawn from the population P(θ).

8. Write the major limitation of crude death rate (CDR). How standardized death rate is superior to CDR ?

9. Mention the various steps involved in conducting a research study.

10. Enumerate various methods of multivariate analysis. Mention advantage of logistic regression analysis.

RET/12/Test B

666 Health Statistics

Question Booklet No. 015

*(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 ....

(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 changes 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 page 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.

SEAL

Total No. of Printed Pages : 15

1. Klinefelter syndrome has the following genetic make up :

   (1) 44 autosomes +xxy

   (2) 44 autosomes + xo

   (3) 45 autosomes + xx

   (4) 45 autosomes + xy

2. Which of the following statement is incorrect related to 'Sickle cell Anaemia'

   (1) It is a autosomal recessive linked disorder

   (2) It is due to a single base mutation of B globulin gene.

   (3) It is inherited in whose one of the parent is carrier and other normal

   (4) It changes shape of RBC from Round to sickle

3. Which property does not belong to cytokines :

   (1) Pleiotropy (2) Redundancy

   (3) Synergy (4) Specificity

4. What is the most likely organism in Patient with common variable immunodeficiency presenting with pneumonia :

   (1) Aspergillus (2) Pneumococcus

   (3) Mycoplasma (4) CMV

5. Which of the following is a mechanical barrier to conception :

   (1) Condom (2) Abortion

   (3) Cu T (4) oral pill

6. By studying analogous structures we look for :

(1) similarities in organ structure

(2) similarities in cell make-up

(3) similarities in appearance and function but different in structure

(4) similarities in appearance that differences in functions

7. Which prediction from the fossil record is in agreement with the theory of evolution ?

(1) Unicellular organisms are first found in strata above

(2) multicellular fossils.

(3) Land animals appear earlier than Land plants in the fossil record. Reptiles appear earlier an insects in the fossil record.

(4) Prokaryote fossils appear earlier than eukaryote fossils.

8. Ductless glands are known as :

(1) Digestive Glands

(2) Milk Glands

(3) Endocrine Glands

(4) Exocrine Glands

9. Virus is chemically composed of :

(1) Starch and Protein

(2) Fat and nucleic acid

(3) D.N.A. and lipids

(4) Protein and Nucleic Acid

10. Thyroxin hormone is secreted by :

(1) Thyroid

(2) Pituitary

(3) Adrenal

(4) Ovary

11. Demographers use the "number of live births per 1000 population" to measure :
(1) Fecundity (2) Fertility
(3) Infant mortality (4) Population growth

12. The time after a common reference event, at which new cases of disease occur among population members is called as :
(1) Incidence time (2) Time interval (3) Index time (4) Incidence rate

13. Mantal Haenszel test is carried to control :
(1) Sampling variability (2) Increase statistical power
(3) Lost to follow up situation (4) Effect of confounders

14. In each of the following cases choose the case in which random variable X is not supposed to have Binomial distribution :
(1) X be number of babies born with blue eyes in a hospital out of 20 births
(2) In a hospital OPD there are 20 patients. Four patients are chosen at random. X be the number of patient suffereing from fever in the sample.
(3) A random sample of 50 persons from a large population is asked a question, Do you smoke ? X be number of those who smoke.
(4) A couple of a family decides to born children until they get a male child. X be the number of children born in family.

SEAL

15. A descrete parameter stochastic process $\{X_n,\ n \geq 0\}$ is called a martingle if :
(1) $E\{|X_n|\} < \infty$ and $E\{X_{n+1}/X_n, X_{n-1}; \ldots\ldots, X_0\} = 0$
(2) $E\{|X_n|\} < \infty$ and $E\{X_{n+1}/X_n, X_{n-1}; \ldots\ldots, X_0\} = X_n$
(3) $E\{|X_n|\} < \infty$ and $E\{X_{n+1}/X_n, X_{n-1}; \ldots\ldots, X_0\} < X_n$
(4) $E\{|X_n|\} < \infty$ and $E\{X_{n+1}/X_n, X_{n-1}; \ldots\ldots, X_0\} > X_n$

16. A life table is based on the assumption that the cohort is closed against :
(1) Fertility (2) Mortality (3) Marriages (4) Migration

17. Which of the following is ***false*** about a probability density function $f(x)$ of a continuous random variable x :
(1) $f(x) > 0$
(2) $\int_{-\infty}^{\infty} f(x)\ dx = 1$
(3) $\int_{a}^{b} f(x)\ dx$ gives the probability of $a \leq k \leq b$
(4) $f(x)$ is a probability value

18. Suppose that A and B are events such that $P(A/B) = P(B/A)$ and $P(A \cup B) = 1$ and $P(A \cap B) > 0$. Which of the following is *True* about $P(A)$:

(1) $P(A) = \frac{1}{3}$ (2) $P(A) = \frac{1}{2}$ (3) $P(A) > \frac{1}{3}$ (4) $P(A) > \frac{1}{2}$

19. In factorial designs, the response produced when the treatments of one factor interact with the treatments of another in influencing the response variable is known as :

(1) Main effect (2) Replication (3) Interaction (4) Random effect

20. A second order process is called weakly stationary if its mean function $m(t)$ is independent of t and its covariance function $c(s, t)$ will be any one of the following :

(1) $c(s,t) = f(s+t)$ (2) $c(s,t) = f(s/t)$

(3) $c(s,t) = f(s \times t)$ (4) $c(s,t) = f(s-t)$

21. Let X be a random variable normally distributed with parameters $\mu = 70$, $\sigma = 10$. Which of the following probability statement is incorrect ?

(1) $P(X > 50) = 0.97$ (2) $P(X < 60) = 0.16$

(3) $P(X > 90) = 0.05$ (4) $P(60 < X < 80) = 0.68$

22. The results of the sample taken cannot be generalized if :

(1) Quota Sampling (2) Simple random sampling

(3) Multistage random sampling (4) Stratified random sampling

23. Let we have data regarding government health care funding (amount in hundred monetary unit), reported disease rate (per thousand) and visit to health care providers (number per thousand). A simple correlation between health care funding and reported disease rate was calculated as 0.89. Which of the following is correct regarding this study ?

(1) Simple correlation between selected variables is reasonable.

(2) A multiple correlation using third variable will provide better association

(3) A partial correlation using third variable will provide better association

(4) Study of correlation between selected variables is meaningless.

24. Which censoring requires a predetermined number of failed items/events ?

(1) Left censoring (2) Right censoring

(3) Type II censoring (4) Interval censoring

25. The amount of variance explained by a factor in factor analysis is shown by :

(1) The eigenvalue
(2) The number of the factor
(3) The factor loadings
(4) The communality

26. Which of the following is not *true* about T^2 statistic ?

(1) The T^2 statistic is uniformly most powerful invariant test
(2) The T^2 statistic is sensitive to departure from normality
(3) The T^2 statistic is likelihood ratio test statistic
(4) The T^2 statistic is used for test of homogenity of covariance matrices.

27. The ANOVA table from a regression model is given below :

Source of variation	Sum of Square	Degree of Freedom
Regression	305	2
Residual	120	22
Total	425	24

The values of R^2 and adjusted R^2 are :

(1) 71.8 % and 69.2 % respectively
(2) 69.2 % and 71.8 % respectively
(3) 71.8 % and 63.2 % respectively
(4) 77.8 % and 69.2 % respectively

28. While applying logistic regression analysis, if P is the probability of occurrence of an event and (1 – p) is its non occurrence, then what would be the limit of $Ln\{P/(1-P)\}$:

(1) 0 to 1
(2) 0 to ∞
(3) $-\infty$ to $+\infty$
(4) – 1 to +1

29. Of the following statements which is ***false***. The estimated partial regression coefficient, β, in a multiple regression analysis :

(1) Represents the average change in the dependent variable when the i^{th} covariate increases by one unit, and all the other covariates are kept constant
(2) Represents the effect of the i^{th} covariate on the dependent variable which is independent of the other covariates.
(3) Has a distribution which follows the t - distribution
(4) Represents the value of the dependent variable when the i^{th} covariate is zero, after adjusting for the other covariates in the model.

30. Which of the following condition is ***true*** for survival function $s(t)$ and hazard function $h(t)$:

(1) $0 \leq s(t) \leq 1$ and $h(t) > 0$ (2) $0 \leq s(t) \leq \infty$ and $h(t) < 0$

(3) $0 \leq s(t) \leq 1$ and $0 \leq h(t) \leq \infty$ (4) $0 \leq s(t) \leq 1$ and $0 \leq h(t) \leq 1$

31. The sample size estimation in a case control study requires :

(1) Level of significance and power of test

(2) Level of significance and exposure rate in general population

(3) Level of significance, power of test, exposure rate in general population and anticipated value of odds ratio

(4) Level of significance, power of test and exposure rate in general population

32. The eigenvalues for the data matrix $\begin{pmatrix} 1 & 0 \\ 1 & 3 \end{pmatrix}$ are :

(1) 2 and 1 (2) 3 and 1 (3) 3 and 2 (4) 4 and 0

33. If variance of error term is variable in the regression analysis it is generally termed as :

(1) Homoscedasticity (2) Heteroscedasticity

(3) Multicollinearity (4) Data mining

34. For confirming a contaminated blood sample in the blood bank, so as not an infected sample is kept in blood bank, one needs :

(1) Highly specific test

(2) A test with high positive predictive ability

(3) A test with high negative predictive ability

(4) Highly sensitive test

35. The prevalence pool is not reduced by :

(1) Death due to disease (2) Recovery from disease

(3) Increase in duration of illness (4) Decrease in duration of illness

36. An odds ratio = 1 indicates that the association of disease with the factor is :

(1) Perfect (2) Low (3) High (4) Does not exist

37. The following tests are for assessing and comparing different survival cox models except :

(1) Median test (2) Wald test

(3) Likelihood Ratio test (4) Score test