

Question Booklet No. ....

*(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, 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.

**Total No. of Printed Pages : 15**

**FOR ROUGH WORK**

# Research Entrance Test – 2014

No. of Questions : 50

Time : 2 Hours

Full Marks : 200

- Note:**
- (i) This Question Booklet contains **40** Multiple Choice Questions followed by **10** Short Answer Questions.
  - (ii) 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.
  - (iii) 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.

1. Decrease in biodiversity in tropical countries is mainly due to :  
(1) Urbanization    (2) Deforestation    (3) Pollution    (4) Soil erosion
2. Where does glycolysis occur in a cell ?  
(1) Chloroplast    (2) Mitochondria    (3) Cytoplasm    (4) Golgibody
3. The process that accounts for transfer of genetic information from DNA to RNA is called as :  
(1) Translocation    (2) Translation  
(3) Transformation    (4) Transcription
4. Leydig's cells produce :  
(1) Thyroxine    (2) Growth hormone  
(3) Testosterone    (4) Progesterone
5. A tumor suppressor gene which is known as "Guardian of the genome" is :  
(1) myc    (2) P<sup>53</sup>    (3) Sr C    (4) H-Ras
6. Which is the function of interleukins ?  
(1) Stimulation of wound healing  
(2) Treatment of infertility  
(3) Dissolving blood clot  
(4) Enhancement of action of immune system
7. Which of the following is *not* an anticoagulant ?  
(1) Heparin    (2) Protamine sulphate  
(3) Warfarin    (4) Hirudin
8. Which of the following is *not* a part of triple response ?  
(1) White reaction    (2) Red reaction    (3) Wheal    (4) Flare
9. Virus envelope is known as :  
(1) Capsid    (2) Virion    (3) Nucleoprotein    (4) Core
10. Peptide synthesis inside a cell takes place in :  
(1) Mitochondria    (2) Chloroplast    (3) Ribosomes    (4) Chromoplast

11. To determine the sample size to compare the two population proportions, one require :
- (1)  $\alpha$  and  $\beta$  (2)  $\alpha$  and anticipated difference  
 (3)  $\beta$  and anticipated difference (4)  $\alpha$ ,  $\beta$  and anticipated difference
12. Which one is the post hoc test ?
- (1) SNK test (2) Paired t test (3) Z test (4) F test
13. Odds ratio (OR) is considered to be insignificant ?
- (1)  $OR > 1$  (2)  $OR < 1$   
 (3) In both above condition (4)  $OR = 1$
14. If the risk difference of developing infection between treated and untreated group is 0.2%, how many cases should be put on treatment to prevent one case of infection ?
- (1) 50 (2) 20 (3) 500 (4) 200
15. In a small study on 10 patients, the serum creatinine level before treatment was recorded as ,  $2.5 \pm 3.4$  and after treatment it was  $2.0 \pm 3.1$ . to test that the treatment given has its effect in reducing the serum creatinine level; one should apply ?
- (1) Paired t test (2) Mann-whitney U test  
 (3) Wilcoxon signed rank test (4) Unpaired t test
16. The relative risk can be obtained by ?
- (1) By only cross sectional study  
 (2) By only case control study  
 (3) By only cohort study  
 (4) By both cross sectional and cohort study
17. The exposure rate if higher in control group than the exposure rate among the cases, the odds ratio (OR) then will be :
- (1)  $>1$  (2)  $<1$  (3)  $=1$  (4)  $>1$  or  $<1$
18. If the  $\beta$  coefficient of an exposure obtained in the logistic regression analysis for a case control study is equal to 1.00 with standard error 0.6, the exposure will appear as ?
- (1) Significant risk factor (2) Significant protective factor  
 (3) Insignificant effect of exposure (4) Can't be judged

19. Which of the following is not true regarding Binomial distribution and hyper geometric distribution :
- (1) In both distributions the trial can be repeated to a finite number of times.
  - (2) In both distributions probability of success at each repetition remains same.
  - (3) In both distributions probability of success at each repetition do not be same.
  - (4) In Binomial distribution repetition is done by with replacement while in hyper geometric distribution without replacement is used.
20. The hemoglobin level of patients in a hospital is normally distributed with mean 10 mg/dl and standard deviation 2 mg/dl. What is probability that a random selection of four patients has mean hemoglobin more than 11 mg/dl ?
- (1) 0.335                      (2) 0.165                      (3) 0.835                      (4) 0.670
21. In case of Bernoulli distribution with parameter  $\theta$  which of the following distributions may be treated as conjugate prior for  $\theta$  ?
- (1) Uniform(a,b)
  - (2) Normal ( $\lambda, \sigma^2$ )
  - (3) Gamma (a,b)
  - (4) Beta ( $\alpha, \beta$ )
22. From a group of four patients a patient was randomly selected and found to be HIV+. What is probability that whole group is HIV+ ?
- (1)  $\frac{1}{4}$                       (2)  $\frac{1}{6}$                       (3)  $\frac{2}{3}$                       (4)  $\frac{2}{5}$
23. Hotteling's  $T^2$  is used to test the significance difference between two mean vectors when ?
- (1) Population variance covariance matrix is known
  - (2) Population variance covariance matrix is unknown
  - (3) Population variance covariance matrix is known or unknown
  - (4) None of the above
24. If eigenvalues for the correlation matrix in case of three variables are 0.8, 0.7 and 1.5 then variation explained by first principal component is :
- (1) 40%                      (2) 50%                      (3) 80%                      (4) 70%
25. The number of basic feasible variables in a transportation problem of order  $m \times n$  is :
- (1)  $m+n+1$                       (2)  $m+n$                       (3)  $m+n-1$                       (4)  $m.n$

26. The feasible region of linear programming problem Maximize  $Z = 5X_1 + 7X_2$  subject to  $X_1 + X_2 \leq 4$  and  $3X_1 + 8X_2 \leq 12$ ,  $X_1, X_2 \geq 0$  is :
- (1) Triangular      (2) Circular      (3) Parabolic      (4) Quadrilateral
27. Select from the following statements which you believe to be false. The estimated partial regression coefficient,  $\beta$ , in a multiple regression analysis :
- (1) Represents the average change in the dependent variable when the  $i^{\text{th}}$  covariate increases by one unit, and all the other covariates are kept constant.
- (2) Represents the effect of the  $i^{\text{th}}$  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  $i^{\text{th}}$  covariate is zero, after adjusting for the other covariates in the model.
28. The type of epidemiological study which deals directly with risk factor of disease is :
- (1) Analytical studies      (2) Descriptive studies  
(3) Ecological studies      (4) Case series studies
29. Demographic transition theory states that, as country becomes industrialised,
- (1) The birth rate declines and then the death rate declines  
(2) The death rate declines and then the birth rate declines  
(3) The death rate declines, but not the birth rate  
(4) The birth and death rate decline together
30. The total fertility rate is :
- (1) The births to women divided by the female population  
(2) The number of births divided by the total population  
(3) The births to women of a given age divided by the total number of women at that age  
(4) The number of children a woman will likely bear in her Lifetime
31. The dependency ratio is the ratio of the :
- (1) Young to middle-aged people  
(2) Young to working-aged people  
(3) Young and old to working- aged people  
(4) Old to middle-aged people

32. If a population roughly doubles in the course of 50 years, its growth rate would be close to :
- (1) 1.5 %                      (2) 5%                      (3) 10%                      (4) 25 %
33. The Human Development Index (HDI) summarizes a great deal of social performance in a single composite index, combining.
- (1) Disparity reduction rate, human resource development rate and the composite index  
 (2) Longevity, education and living standard  
 (3) Minimum schooling, adult literacy and tertiary educational attainment  
 (4) Human resource training, development and R&D
34. Which of the following is the best indicator to assess the quality of health and standard of living of a country ?
- (1) Age-specific death rate                      (2) Age-specific birth rate  
 (3) Infant mortality rate                      (4) Crude death rate
35. The force which acts against the achievement of the highest possible level of population growth is known as
- (1) Saturation level                      (2) Population pressure  
 (3) Carrying capacity                      (4) Environmental resistance
36. The best study to see the aetiological role of a risk factor in disease causation.
- (1) Ecological studies                      (2) Intervention studies  
 (3) Cohort studies                      (4) Nested case control study
37. Matching in case-control studies is done to control uncertainties due to :
- (1) Sampling fluctuation                      (2) Bias due to confounders  
 (3) Loss of patients to follow up                      (4) Lack of statistical power
38. Suppose your district has 180 primary schools. You want to estimate the prevalence of vitamin A deficiency in the children in these schools. Which sampling procedure would be best out of :
- (1) Simple random sampling                      (2) Systematic sampling  
 (3) Stratified random sampling                      (4) Multistage random sampling



39. Which one of the following is *not* true for Biostatistics ?
- (1) It is a science that helps to manage medical uncertainties.
  - (2) It provides methods for clinical evaluation of a patient.
  - (3) It provides methods for collection and analysis of health data.
  - (4) It provides methods to combine probabilities with clinical judgements to help in making a valid medical decision.

40. Cause of death *cannot* be obtained by :
- (1) Verbal autopsy
  - (2) Medical certificate of death
  - (3) Census report
  - (4) Post-mortem examination

*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.*

1. Obtain the formula to calculate the samples size in a case and control study (equal number of cases and controls) to estimate odds ratio (OR).
2. In a matched case control study design, show that odds ratio is  $b/c$ .  $b$  indicates the number of pairs where cases are exposed and controls are unexposed and  $c$  the number of pairs where cases are unexposed and controls are exposed.
3. Show that the functional form of  $\ln \frac{P_x}{Q_x}$  is linear.
4. Let  $Y = [y_1 \ y_2 \ y_3]$  have  $N_3(\mu, \Sigma)$ , where  $\mu = [1 \ -1 \ 0]'$  and  $\Sigma = \begin{bmatrix} 4 & 1 & 2 \\ 1 & 4 & 2 \\ 2 & 2 & 4 \end{bmatrix}$ . Obtain the marginal distribution of  $\begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$  and correlation matrix of  $Y$ .
5. Let  $X_1, X_2, \dots, X_n$  are random sample from Bernoulli distribution with parameter  $\theta$ . By taking Beta ( $a, b$ ) as prior distribution for  $\theta$  obtain Bayes estimator of under squared error loss function.
6. Compare the age-specific mortality curves for developing and developed countries and explain the reasons for difference in the shape of the curves.
7. Differentiate between a sample survey and census.
8. Explain GRR and NRR and show that  $NRR \leq GRR$ . When GRR will be equal to NRR ?
9. Distinguish between research methods and research methodology. Also describe the various steps of research process chronologically.
10. Define Cox pH hazard model. Describe a method to assess the proportionality.

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**FOR ROUGH WORK**

