BIOSTATISTICS (SEMESTER - 6)

CS/B.OPTM/SEM-6/BO-603/09

CS/B.OPTM/SEM-6/BO-603/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
BIOSTATISTICS (SEMESTER - 6)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question.**

   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

Question Number				Group – A					Group – B		Group – C		Total Marks	Examiner's Signature
Marks Obtained														

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Head-Examiner/Co-Ordinator/Scrutineer

6755 (09/06)

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :   10 × 1 = 10

    i)   If two unbiased dice are rolled together, what is the probability of getting a difference of zero point ?

       a) $\dfrac{1}{2}$ b) $\dfrac{1}{3}$

       c) $\dfrac{1}{5}$ d) $\dfrac{1}{6}$.

    ii)   If A and B are two dependent events, then

       a) $P(A \cup B) = P(A) \cdot P(A/B)$ b) $P(A \cap B) = P(A)\, P(B/A)$

       c) $P(A \cap B) = P(A) \cdot P(B)$ d)   none of these.

    iii)   If $P(A) = \dfrac{2}{3}, P(B) = \dfrac{3}{4}, P\left(\dfrac{A}{B}\right) = \dfrac{2}{3}$, then the value of $P\left(\dfrac{B}{A}\right)$ is equal to

       a) $\dfrac{1}{3}$ b) $\dfrac{2}{3}$

       c) $\dfrac{3}{4}$ d) $\dfrac{1}{2}$.

    iv)   If there are three observations 15, 20 and 25, then the sum of the deviations of the observations from their A.M. is

       a)   0   b)   5

       c)   – 5   d)   none of these.

v)   If $u = 2x + 5$ and $v = 3y - 7$ and the correlation coefficient between x and y is 0·86, then the correlation coefficient between u and v is

     a)   0·86   b)   0·43

     c)   – 0·43   d)   – 0·86.

vi)   If Var (X) = 9, Var (Y) = 4 and Var ($X - Y$) = Var (X), then the regression coefficient of Y on X will be

     a) $\dfrac{3}{2}$ b) $\dfrac{2}{9}$

     c) $\dfrac{9}{2}$ d)   none of these.

vii)   Standard deviation of the six numbers 5, 5, 5, 7, 7, 7 will be

     a)   1   b)   2

     c)   6   d)   none of these.

viii)   The probability of getting two heads in tossing two unbiased coins is

     a) $\dfrac{1}{3}$ b) $\dfrac{5}{8}$

     c) $\dfrac{1}{2}$ d)   none of these.

ix)   Can two independent events with positive probabilities be mutually exclusive as well ?

     a)   Yes, they can be   b)   No, they cannot be

     c)   It is meaningless   d)   None of these.

x)   The coefficient of correlation is independent of

     a)   change of origin only

     b)   change of scale only

     c)   change of origin and scale both

     d)   neither change of origin nor change of scale.

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xi) If Q_1 and Q_3 are the first and the third quartiles of a distribution, then the quartile deviation Q is given by

a) $Q_3 - Q_1$

b) $\dfrac{Q_3 - Q_1}{2}$

c) $Q_3 + Q_1$

d) $\dfrac{Q_3 + Q_1}{2}$.

xii) The range of probability of an event A is

a) $-1 \le P(A) \le 1$

b) $-1 \le P(A) \le 0$

c) $0 \le P(A) \le 1$

d) $-\dfrac{1}{3} \le P(A) \le \dfrac{1}{2}$.

xiii) If $B \subset A$, where A and B are two arbitrary events, then

a) $P(A) \le P(B)$

b) $P(B) \le P(A)$

c) $P(A) = P(B)$

d) $P(B) = 1 - P(A)$.

xiv) The probability density function of a standard normal variate z is

a) $\dfrac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}, -\infty < z < \infty$

b) $\dfrac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}, 0 < z < \infty$

c) $\dfrac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}, -\infty < z < 0$

d) $\dfrac{1}{2\pi} e^{-z^2}, -\infty < z < \infty$.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions. $3 \times 5 = 15$

2. A box contains 12 electric bulbs of which 5 are defectives. A man selects 3 bulbs at random. What is the mathematical expectation $E(X)$ of the number of defective bulbs (X) in his selection ?

3. The incidence of a particular disease in an area is such that 20% of the people of that area suffers from it. What size of a sample should be taken so as to ensure that the error of the estimation of the proportion should not be more than 5% with 95% confidence ? Given, $z_{0.025} = 1.96$.

4. If A and B are two independent events and $P(A) = \dfrac{2}{3}, P(B) = \dfrac{3}{5}$, find the value of $P(A \cup B)$.

5. What do you understand by Spearman's rank correlation coefficient ? If the sum of squares of differences of ranks, given by two judges, of 10 students is 33, find the rank correlation coefficient.

6. What do you understand by simple random sampling with and without replacement ? If the population size is N and the sample size is n, what will be the number of samples under SRSWR and SRSWOR ?

7. A sample of size 15 has mean 3·5 and standard deviation 3. Another sample of size 22 has mean 4·7 and standard deviation 4. If the two samples are pooled together, find the mean and the standard deviation of the combined sample.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. $3 \times 15 = 45$

8. From the population consisting of the observations 3, 7, 5 and 9, enumerate all possible samples of size 2 drawn by SRSWR.

    a) Find the population mean

    b) Find the population standard deviation

    c) Find the mean of the sampling distribution of mean

    d) Find the standard error of the mean. $2 + 3 + 8 + 2$

9. a) The mean and standard deviation of 20 items is found to be 10 and 2 respectively. At the time of checking, it was found that one item 8 was incorrect. Calculate the mean and the standard deviation, if it is replaced by 12.

   b) The following data are given for marks in Mathematics and Statistics at a certain examination :

	Mathematics	Statistics
Mean Marks	39·5	47·5
Standard deviation of marks	10·5	16·8

Co-efficient of correlation between them is 0·4. Find the equation of the two regression lines. $10 + 5$

10. a) If the two regression lines are $3x + 9y = 46$ and $3y + 12x = 19$, find which one among them is the regression line of x on y and which one is the regression line of y on x and justify your answer.
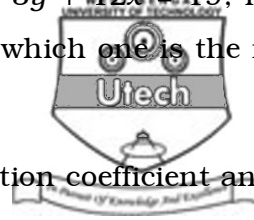
   If the variance x is 4, find the means, the correlation coefficient and the variance of y.

   b) If the mode of the following distribution, which represents the number of minutes spent per week by a group of students on the internet, is 339·5 minutes per week, find the missing frequency. Then find Median of the complete frequency distribution.

No. of minutes/week :	0 - 99	100 - 199	200 - 299	300 - 399	400 - 499	500 & above
No. of students :	26	32	65	?	60	42

8 + (3 + 4)

11. a) A picnic is arranged to be held on a particular day. The weather forecast says that there is 80% chance of rain on that day. If it rains, the probability of a good picnic is 0·3 and if it does not, the probability is 0·9. What is the probability that the picnic will be good ?

   b) While calculating the coefficient of correlation between variables x and y, the following results were obtained : $n = 25$, $\sum x = 125$, $\sum y = 100$, $\sum x^2 = 650$, $\sum y^2 = 460$, $\sum xy = 508$. It was however later discovered at the time of checking that two pairs of observations (x, y) were copied wrongly as (6, 14) and (8, 6) while the correct values were (8, 12) and (6, 8) respectively. Determine the correct correlation coefficient.
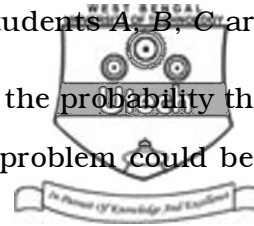
7 + 8

12. a) After shift of origin and change of scale, a frequency distribution of a continuous variable (x) with equal class width takes the following form of frequency distribution of the changed variable (u) :

u :	− 3	− 2	− 1	0	1	2	3
Frequency :	3	5	12	49	22	8	1

   If the mean and standard deviation of the original frequency distribution are 56 and 11 respectively, find the original frequency distribution.

b) The probabilities of solving a problem by three students A, B, C are $\frac{3}{7}$, $\frac{3}{8}$ and $\frac{1}{3}$ respectively. If all of them try independently, find the probability that the problem is not solved. Find also the probability that the problem could be solved by one person only. 8 + 7

13. a) What are the measures of central tendency of a variable ? Compare between them.

b) Define Pearsonian product-moment correlation coefficient, and show that it lies between – 1 and + 1. Show scatter diagrams for the cases when it is + 1 and – 1.

(3 + 6) + 6

14. a) Define Standard Deviation and Mean Deviation of a variable. Compare between them as measures of dispersion.

b) Marks of 5 students in Mathematics and Statistics are given as under :

| Mathematics : | 38 | 48 | 43 | 40 | 41 |
| Statistics : | 31 | 38 | 43 | 33 | 35 |

Find the regression lines. When marks of a student in Mathematics is 42, determine his most likely marks in Statistics. 8 + 7

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END