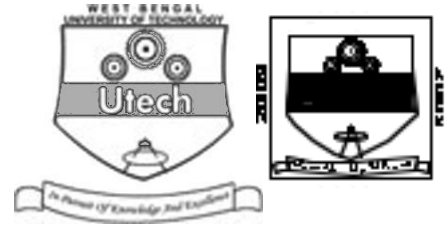


STATISTICS – II (SEMESTER - 2)

CS/BBA (H), BIRM, BSCM/SEM-2/BBA-203/09



1.
Signature of Invigilator

2.
Signature of the Officer-in-Charge

Reg. No.

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

Roll No. of the Candidate

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

**CS/BBA (H), BIRM, BSCM/SEM-2/BBA-203/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
STATISTICS – II (SEMESTER - 2)**

Time : 3 Hours]

[Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

- This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **36 pages**. The questions of this concerned subject commence from Page No. 3.
- In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
 - 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.
- Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
- Read the instructions given inside carefully before answering.
- You should not forget to write the corresponding question numbers while answering.
- 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.
- Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
- 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**.
- 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

FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

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

.....
Head-Examiner / Co-Ordinator / Scrutineer

2284 (09/06)



DO NOT WRITE ON THIS PAGE



ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
STATISTICS – II
SEMESTER – 2



[Full Marks : 70]

Time : 3 Hours]

GROUP – A**(Multiple Choice Type Questions)**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10
- i) If x and y are random variables with expectations 3 and 5 respectively, then expectation of $3x - 5y + 16$ is
- a) 16 b) - 16
- c) 2 d) 0.
- ii) A box contains 6 white and 4 red balls. One ball is drawn at random, the probability that it is white, is
- a) $\frac{2}{5}$ b) $\frac{3}{5}$
- c) $\frac{1}{5}$ d) $\frac{4}{5}$.
- iii) If A and B are two events such that $P(A) = 0.4$, $P(A \cup B) = 0.7$ and A and B are independent, then $P(B)$ is
- a) 0.2 b) 0.3
- c) 0.4 d) 0.5.
- iv) Probability of the sample space is
- a) 1 b) $\frac{1}{2}$
- c) 0 d) none of these.
- v) If the population size is 100, sample size is 4 and S.D. = 16, then the standard error of the sample mean in SRSWR is
- a) 8 b) 2
- c) 0 d) 1.



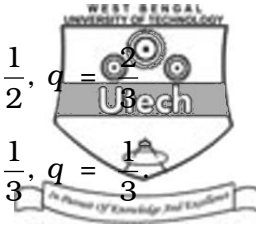
vi) Binomial distribution is called symmetric if

a) $p = \frac{1}{2}, q = \frac{1}{2}$

b) $p = \frac{1}{2}, q = \frac{2}{3}$

c) $p = 1, q = 1$

d) $p = \frac{1}{3}, q = \frac{1}{3}$



vii) Two unbiased coins are thrown. The probability of getting one head is

a) $\frac{1}{2}$

b) $\frac{1}{4}$

c) $\frac{3}{4}$

d) 1.

viii) If B^c is the complement of the event B , then

a) $P(B^c) = 1 - P(B)$

b) $P(B^c) = P(B)$

c) $P(B^c) = 1 + P(B)$

d) none of these.

ix) If A and B are two events, then

a) $P(A \cup B) \leq P(A) + P(B)$

b) $P(A \cup B) > P(A) + P(B)$

c) $P(A \cup B) \leq P(A) \cdot P(B)$

d) $P(A \cup B) > P(A) \cdot P(B)$.

x) If $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(A \cap B) = \frac{1}{4}$, then $P(A \cup B)$ is

a) $\frac{7}{12}$

b) $\frac{3}{4}$

c) $\frac{1}{8}$

d) $\frac{5}{6}$.

xi) Sampling distribution is the distribution of

a) parameter

b) statistic

c) sample

d) population.

xii) The sample mean \bar{x} is an unbiased estimator of the population mean μ when

a) $E(\bar{x}) = 0$

b) $E(\bar{x}) = 1$

c) $E(\bar{x}) = \mu$

d) none of these.



xiii) If a random variable X follows a Poisson distribution with parameter m , then the mean and variance of the distribution are respectively

a) m and $\frac{1}{m}$

b) $\frac{1}{m}$ and m

c) $\frac{1}{m}$ and $\frac{1}{m}$

d) m and m .



xiv) The p.d.f. of a continuous variable x is $f(x) = k(x - 1)(2 - x)$, $1 \leq x \leq 2$. Then the value of k is

a) $\frac{1}{6}$

b) 6

c) 0

d) 1.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions.

$3 \times 5 = 15$

2. A pair of dice is thrown 200 times. If getting a sum of 9 points is considered to be a success, find the variance of the number of successes.
3. A die was thrown 400 times and SIX resulted 80 times. Do the data justify the hypothesis of an unbiased die ?
4. A random sample of the heights of 100 students from a large population of students is drawn. The average height of the students in the sample is 5.6 feet while the S.D. is 0.75 ft.

Find

i) 95%

ii) 99%

confidence limits for the average height of all the students in the population.

5. A certain diet newly introduced to each of the 12 pigs resulted in the following increase of body weight : 6, 3, 8, - 2, 3, 0, - 1, 1, 6, 0, 5 and 4. Can you conclude that the diet is effective in increasing the weight of the pigs ? (Given that $t_{0.05,11} = 2.20$).
6. A discrete random variable X follows a Poisson distribution such that $P(X = 1) = P(X = 2)$. Find the variance of X .



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions.



3 × 15 = 45

7. a) For two events A and B which are not necessarily mutually exclusive, prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
- b) Two bags contain respectively 3 white and 2 red balls, 2 white and 4 red balls. One ball is drawn at random from the first bag and is put into the second, then a ball is drawn from the second bag. What is the probability that the ball drawn from the second bag is white ?
- c) If A and B are two events, prove that $P\left(\frac{A}{B}\right) = 1 - P\left(\frac{A^c}{B}\right), P(B) > 0$.
- d) Check the consistency of the statement : “The probability that a mineral sample will contain copper is 0.28 and the probability that it will contain copper and iron is 0.36.”

5 + 5 + 3 + 2

8. a) Define with an example, a continuous random variable.
- b) Joint probability mass function of two random variables X and Y is given below :

X \ Y	1	2	3	Total
1	$\frac{2}{21}$	$\frac{3}{21}$	$\frac{4}{21}$	$\frac{9}{21}$
2	$\frac{1}{21}$	$\frac{2}{21}$	$\frac{1}{21}$	$\frac{4}{21}$
3	$\frac{3}{21}$	$\frac{4}{21}$	$\frac{1}{21}$	$\frac{8}{21}$
Total	$\frac{6}{21}$	$\frac{9}{21}$	$\frac{6}{21}$	1

- i) Write the marginal distribution of X .
- ii) Find the covariance between X and Y .



c) If X is a random variable, then prove that $V(aX + b) = a^2 V(X)$.

d) Define Binomial distribution.



3 + 3 + 4 + 3 + 2

9. a) If a random experiment of tossing a fair coin thrice, 'A' denotes getting head in the first toss and 'B' getting tail in the third toss, examine if A and B are independent.

b) If $P(X = j) = \frac{1}{n}$, for all $j = 1, 2, \dots, n$,

$P(Y = k) = \frac{1}{n}$, for all $k = 1, 2, \dots, n$ and X, Y are independent

random variables, then prove that $E(XY) = \{(n+1)/2\}^2$.

c) The letters of the word ONION are arranged at random. What is the probability that the arrangement begins as well as ends with 'N' ? 5 + 5 + 5

10. a) A die is thrown 150 times with the following results :

No. of turned up :	1	2	3	4	5	6
Frequency :	19	23	28	17	32	31

Test the hypothesis that the die is unbiased. (Given $\chi_{0.05,5}^2 = 11.07$)

b) Prove that for two discrete random variables X and Y,

$$E(X + Y) = E(X) + E(Y)$$

7 + 8

11. a) State and prove Baye's theorem.

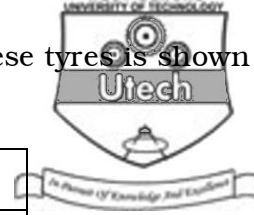
b) A factory has two machines. The empirical evidence has established that machine I and II produce 30% and 70% of the output respectively. It has also been established that 5% and 1% of the output produced by these machines respectively was defective. A defective item is drawn at random. What is the probability that the defective item was produced by machine I or II ? 8 + 7



12. a) A random sample of 5 motor car tyres is taken from each of 3 brands manufactured by 3 companies. The lifetime of these tyres is shown below :

Life time of Tyres ('000 miles)

Brand	A	B	C
	35	32	34
	34	32	33
	34	31	32
	33	28	32
	34	29	33



Carry out ANOVA.

- b) What are the properties of maximum likelihood estimator ? Define maximum likelihood estimator. 9 + 6

13. a) A population consists of 4 members 3, 7, 11, 15. Consider all possible distinct samples of size 2 which can be drawn with replacement.

Find :

- i) Population mean
 - ii) Population S.D
 - iii) Mean of the sampling distribution of means.
- b) The probability that Asok can solve a problem is $\frac{4}{5}$, that Amol can solve is $\frac{2}{3}$ and that Adbul can solve is $\frac{3}{7}$. If all of them try independently, find the probability that the problem will be solved. 8 + 7

14. a) Explain the following terms related to testing of hypothesis :

- i) Null hypothesis and alternative hypothesis
- ii) Type-I and Type-II errors.



- b) The average number of defective articles per day in a certain factory is claimed to be less than the average for all the factories. The average for all the factories is 30.5. A random sample of 100 days showed the following distribution :

Class limits	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	Total
No. of days	12	22	20	30	16	100

Calculate the Mean and S.D. of the sample and use it to claim that the average is less than the figure for all factories, at 5% level of significance.

(Given, at 5% level of significance, the critical value of Z for one-tailed test is 2.33).

$$(2 + 2) + (2 + 2) + 7$$

END