Name : …………………………………………………………

Roll No. : …………………………………………………………

Invigilator's Signature : ………………………………………

CS/BBA(H)/BIRM/BSCM/SEM-2/BBA-203/2010

2010

STATISTICS – II

Time Allotted : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

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

    $10 \times 1 = 10$

    i) If x and y are random variables with expectation 3 and 5 respectively, then expectation of $3x – 5y + 16$ is
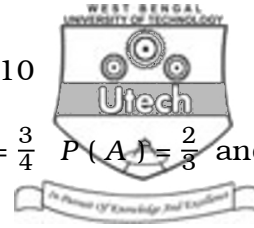
        a)   16   b)   – 16

        c)   2   d)   0.

    ii) Probability of the sample space is

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

        c)   0   d)   none of these.

    iii) If A and B are two events such that $P (A) = 0{\cdot}4$, $P (A \bigcup B) = 0{\cdot}7$ and A and B are independent, then $P (B)$ is

        a) $0{\cdot}2$ b) $0{\cdot}3$

        c) $0{\cdot}4$ d) $0{\cdot}5$.

iv) If A and B are events with $P(A+B)=\frac{3}{4}$ $P(A)=\frac{2}{3}$ and $P(AB)=\frac{1}{4}$ then find $P(A)$

a) $\frac{1}{3}$

b) $\frac{2}{3}$

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

d) none of these.

v) If the population size is 100, sample size is 4 and S.D. is 16, then the standard error of the sample mean in SRSWR is

a) 8

b) 2

c) 0

d) 1.

vi) The variance of binomial distribution is

a) np

b) npq

c) npq^2

d) np^2q.

vii) A box contains 6 white and 4 red balls. One ball is drawn at random, probability that it is white, is

a) $\frac{1}{5}$

b) $\frac{2}{5}$

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

d) $\frac{3}{5}$.

viii) If 5 coins are tossed simultaneously, the total number of possible outcomes is

a) 10

b) 32

c) 5

d) 16.

ix) $E(X)$ of the probability distribution

X :	1	2	3	4	5	6
$P(x)$:	0·05	0·43	0·27	0·12	0·09	0·04

is given by

a) 2·8

b) 1·6

c) 5

d) 7·9 .

x) If two cards are drawn from a well shuffled pack of 52 cards. The probability that both the cards are of same colour is

a) $\frac{1}{4}$ b) $\frac{3}{4}$

c) 1 d) none of these.

xi) When two perfect coins are tossed simultaneously, the probability of getting at least one head is

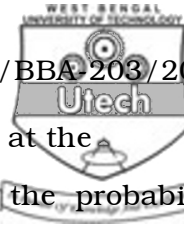a) $\frac{1}{2}$ b) 0

c) $\frac{3}{4}$ d) none of these.

xii) The condition of binomial distribution is

a) trials are dependent

b) trials are independent

c) trials are equal

d) none of these.

xiii) The expectation of a random variable cannot be negative. It is

a) true b) false

c) partially true d) none of these.

3 [Turn over

xiv) For a binomial distribution, if n = 4, $p = \frac{1}{3}$, then variance is

    a) $\frac{2}{9}$ b) $\frac{4}{3}$

    c) $\frac{8}{9}$ d) $\frac{2}{3}$.

xv) A discrete random variable X follows uniform distribution and takes only the values 6, 8, 11, 12, 17. The probability of p (x = 8) is

    a) $\frac{2}{3}$ b) $\frac{1}{5}$

    c)   0   d) $\frac{8}{5}$.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following.   3 × 5 = 15

2. Given that P (A) = $\frac{5}{8}$, P (B) = $\frac{5}{8}$, and P ($A \bigcup B$) = $\frac{3}{4}$, find P (A/B) and P (B/A). Also show whether A and B are independent.

3. From a bag containing 4 white and 6 red balls, different balls are drawn at random. Find the expected number of white balls drawn.

4. Using the formulae for binomial distribution, find the probability of rolling at most 2 sixes in 5 rolls of a dice.

5. An office switchboard receives telephone calls at the rate of 3 calls per minute on average. What is the probability of receiving no calls in one minute interval ? Given $(e^{-3} = 0.4979)$

6. If $y = ax + b$ where a and b are constants, prove that

   $E(y) = a.E(x) + b.$

GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following. $3 \times 15 = 45$

7. a) If A and B are independent events, then prove that

   i) $\overline{A}$ and B are also independent,

   ii) $\overline{A}$ and $\overline{B}$ are also independent. $2 + 3$

   b) Define probability mass function and probability density function for discrete and continuous random variables respectively. 4

   c) The diameter of an electric cable, say, X is assumed to be a continuous random variable with *p.d.f.*
   $f(x) = 6x(1-x), 0 \le x \le 1.$

   i) Check that $f(x)$ is *p.d.f.*

   ii) Determine a number b such that

   $P(X < b) = P(X > b).$ 6

8. a) A random variable X has the following probability distribution :

Value of X, x	0	1	2	3	4	5	6	7	8
p (x)	k	3k	5k	7k	9k	11k	13k	15k	17k

   i) Determine k.

   ii) Find $P (X > 3)$, $P (X \geq 3)$. 8

   b) A die is thrown 60 times with the following results :

Face :	1	2	3	4	5	6	Total
Frequency :	6	10	8	13	11	12	60

   Are the data consistent with the hypothesis that the die is unbiased ?

   $\{$ Given $\chi^2 = 11 \cdot 07$ for 5 $d.f.$ $\}$ 7

9. a) State and prove Bayes' theorem. 7

   b) Two identical boxes contain 5 white, 7 red balls and 5 white, 5 red balls respectively. One box is chosen at random and a ball is drawn from it. If the ball drawn is found to be white, calculate the probability that it is drawn from the first box. 5

   c) If A and B are independent events and $P (A) = \frac{2}{3}$, $P (B) = \frac{3}{5}$, find $P (A + B)$, $P (A^c / B)$ and $P (A^c B)$.

   3

10. a) Deduce the mean and variance of Poisson Distribution.

9

b) The mean I.Q. of a group of children is 90 with a standard deviation of 20. Assuming I.Q. is normally distributed, find the percentage of children with I.Q. over 100. Given ϕ (0·5) = 0·6915. 6

11. 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. 8

b) The probability that Asok can solve a problem is $\frac{4}{5}$, that Amal can solve is $\frac{2}{3}$ and that Abdul can solve is $\frac{3}{7}$. If all of them try independently, find the probability that the problem will be solved. 7