

M.C.A. DEGREE I SEMESTER EXAMINATION, NOVEMBER 2005

CAS 2102 PROBABILITY AND STATISTICS

Time : 3 Hrs.

Maximum Marks : 50

PART - A

(Answer ALL questions)(Each question carry TWO marks)

(15 x 2 = 30)

- I
- For any two events A and B, prove that $P(A' \cap B) = P(B) - P(A \cap B)$.
where A' is the complementary event of A.
 - A box contains 6 red, 4 white and 5 black balls. A person draws 4 balls from the box at random. Find the probability that among the balls drawn there is at least one ball of each colour.
 - A problem in statistics is given to the three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?
- II
- Define Poisson distribution. If the random variable X has a Poisson distribution such that $P(X=1)=P(X=2)$ find $P(X=4)$.
 - A random variable X takes the values -2, -1, 0 and 1 with probabilities $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{1}{2}$ respectively. Find:
 - the mean of the distribution
 - probability distribution of $Y=X^2+1$
 - Define beta variate of the first kind. Obtain its mean and variance.
- III
- A coin is tossed until a head appears. What is the expectation of the number of tosses required?
 - Define characteristics function. Write any two properties of characteristic function.
 - State weak law of large numbers.
- IV
- Compare mean and median.
 - Define standard deviation. What are the uses of standard deviation?
 - Explain the concept of regression. Distinguish between linear and non linear regressions.
- V
- Discuss briefly the basic principles of a sample survey.
 - Define systematic sampling. Discuss its uses.
 - Distinguish between Type I and Type II errors.

PART - B

(Answer ALL questions)(Each question carry FOUR marks)

(5 x 4 = 20)

- VI
- State Bayes Theorem. The chances of X, Y, Z becoming managers of a certain company are 4:2:3. The probabilities that bonus scheme will be introduced if X, Y, Z become managers are 0.3, 0.5 and 0.8 respectively. If the bonus scheme has been introduced, what is the probability that X is appointed as the manger.

OR

(Turn Over)

VI B If C_1 and C_2 are subsets of the sample space @, show that $P(C_1 \cap C_2) \leq P(C_1) \leq P(C_1 \cup C_2) \leq P(C_1) + P(C_2)$

VII A Compute the measures of skewness and kurtosis of the Poisson distribution with mean μ .

OR

VII B Define Normal distribution. If X is $N(75, 100)$, find $P(X < 60)$ and $P(70 < X < 100)$.

VIII A State and Prove the Central Limit Theorem.

OR

VIII B Find the characteristics function of the following distribution and hence the means

(i) $f(x) = ae^{-ax}$, $a > 0, x > 0$

(ii) $f(x) = \frac{1}{2}e^{-|x|}$, $-a < x < \infty$

IX A Define moments and moment generating function (m.g.f) of a random variable X . If $M(t)$ is the m.g.f. of a random variable X about the origin, show that the moment μ^r is given by

$$\mu^r = \left(\frac{d^r M(t)}{dt^r} \right)_{t=0}$$

OR

IX B From the data given below obtain the regression equation of x on y :

x	:	2	3	7	8	10
y	:	10	9	11	8	12

X A Describe the procedure of stratified random sampling. Under what conditions is stratified random sampling preferred to simple random sampling and why? Point out a situation suitable for the use of stratified random sampling.

OR

X B Samples of two electric bulbs were tested for length of life and following data were obtained.

	<u>Type I</u>	<u>Type II</u>
Sample No	$n_1=8$	$n_2=7$
Sample means	$\bar{x}_1=1,234$ hrs.	$\bar{x}_2=1,036$ hrs.
Sample S.D	$S_1=36$ hrs.	$S_2=40$ hrs.

Is the difference in the means sufficient to warrant that type I electric bulb is superior type II regarding length of life ?
