

## M.C.A. DEGREE II SEMESTER EXAMINATION APRIL 2013

CAS 2202/2205 APPLIED PROBABILITY AND STATISTICS  
(2008 revision) (Supplementary)

Time : 3 Hours

Maximum Marks : 50

**PART A**  
(Answer ALL questions)

(15 x 2 = 30)

- I. (a) Define arithmetic mean. Give its limitations.  
(b) Give any four measures of dispersion.  
(c) What is the proportion method of studying association? Illustrate the case when two attributes will be independent.
- II. (a) State and prove the additive theorem of probability.  
(b) State Baye's theorem.  
(c) Find the moment generation function of  
 $f(x) = \lambda e^{-\lambda x}; \lambda, x > 0.$
- III. (a) Define a  $\chi^2$  statistic. What is Yates correction?  
(b) Describe simple random sampling (i) with replacement and (ii) without replacement  
(c) Define:  
(i) Unbiased estimate  
(ii) Sufficient estimate.
- IV. (a) State Neyman-Pearson lemma.  
(b) Explain: (i) significance level (ii) Power of a test.  
(c) Define a student's t statistic.
- V. (a) Why are there in general, two regression lines? When do they coincide?  
(b) State the ANOVA model clearly stating to the assumptions for testing hypothesis of equality of means.  
(c) What would be the lines of regression if (i)  $r = +1$  (ii)  $r = -1$ .

**PART B**

(5 x 4 = 20)

- VI. A. Distinguish between classification and tabulation. Explain the method of classification by class intervals with reference to (i) number of classes (ii) length of the class interval (iii) class limits.

**OR**

- B. Investigate the association between darkness of eye color in father and son from the following data.

Fathers with dark eyes and sons with dark eyes = 50

Fathers with dark eyes and sons not with dark eyes = 79

Fathers not with dark eyes and sons with dark eyes = 89

Fathers not with dark eyes and sons not with dark eyes = 782.

What are the conditions for testing the consistency of observations of two attributes A and B?

- VII. A. A chain is made of 10 links. The tensile strength of each link is equally likely to have any value between 60 and 75 lb. What is the probability that the chain will break under a load of 65 lb?

**OR**

- B. What is a binomial distribution? Stating the conditions clearly show that the binomial distribution tends to the normal distribution.

**(P.T.O)**

- VIII. A. Two treatments were tried out in a control of a certain type of plant infection and the following results were obtained.

Treatment A: 200 plants examined and 24 found infected.

Treatment B: 200 plants examined and 9 found infected.

May we conclude that treatment B is superior to treatment A in controlling this type of infections.

OR

- B. Describe the method of least squares for fitting a curve. Illustrate the method by fitting the curve  $y = ab^x$ ,  $a, b > 0$ .
- IX. A. (i) Define student's 't' and write down without proof its sampling distributions.  
(ii) Explain the use of t-tests in two different situations.

OR

- B. Two random samples drawn from normal populations are

I 20, 16, 26, 27, 23, 22, 18, 24, 25, 19

II 27, 33, 42, 35, 32, 34, 38, 28, 41, 43, 30, 37

Obtain the estimates of the variances of the populations. Test whether the two populations have the same variances.

- X. A. You are given the following results for the heights (X) and weight (Y) of 1000 workers in a factory

$$\bar{X} = 68 \text{ inches, } \sigma_x = 2.5 \text{ inches}$$

$$\bar{Y} = 150 \text{ lb, } \sigma_y = 20 \text{ lb}$$

$$r_{xy} = .6$$

Estimate from the above data

- (i) the height of a particular factory worker whose weight is 200 lb.  
(ii) the weight of a particular factory worker who is 5 feet tall.

OR

- B. To assess the significance of possible variations in performance in a certain test as between the grammar schools of a city, a common test was given to students taken at random from the senior fifth form of each of the four schools. Carry out ANOVA and comment on the results.

Schools/Marks obtained								
A	8	7	4	5	5	5	6	6
B	7	5	5	4	3	4	6	7
C	5	3	4	4	3	5	4	4
D	10	5	6	4	8	7	8	8

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