MCA II/05.14-0472(a)

B

MCA DEGREE II SEMESTER EXAMINATION MAY 2014

CAS 2205/2202 APPLIED PROBABILITY AND STATISTICS

(New Scheme - Supplementary)

Time: 3 Hours | Maximum Marks: 50

PART A

(Answer ALL questions)

(15 x 2 = 30)

I. (a) Define (i) equally likely events
(ii) mutually exclusive events and
(iii) independent events.

(b) If A and B are independent events then show that A^c and B^c are independent.

(c) A problem is given to A and B. The probability with which A solves is $\frac{1}{2}$ and that with which B solves is $\frac{1}{3}$. What is the probability that the problem is solved?

II. (a) If 1 and 2 are the modes of a poisson random variable X, find X, find $P(X=0)$

(b) Find the moment generating function of an exponential random variable and hence find its mean and variance.

(c) The mean and variance of a binomial random variable X are 16 and 8 respectively. Find (i) $P(X=O)$ and (ii) $P(X>0)$.

III. (a) Distinguish between parameter and statistic. What do you mean by standard error? What is the standard error of the sample mean when sample is taken from a normal population?

(b) Define SRSWR and SRSWOR. Which one is more efficient?

(c) Examine whether the weak law of large numbers holds for the sequence (X_k) of independent random variables with $P(X_k = \pm 1) = \frac{1}{k}$ and $P(X_k = 0) - \frac{2}{k}$.

IV. (a) What do you mean by the estimation of parameters by the method of maximum likelihood?

(b) Distinguish between simple and composite hypothesis with an example for each.

(c) Define (i) Type I error
(ii) Type II error
(iii) Significance level and
(iv) Power of the test.

V. (a) What do you mean by correlation and regression?

(b) Why there are two regression lines for a bivariate data?

(c) Explain the one way analysis of variance and write the mathematical model and the ANOVA table.

PART B

*(All questions carry **EQUAL** marks)*

(5 x 4 = 20)

VI. Define conditional probability. State and prove the multiplication theorem of probability of any two events in the same sample space.

OR

VII. The probability that X, Y and Z becoming managers are $\frac{4}{9}, \frac{2}{9}$ and $\frac{1}{3}$ respectively. The probability that bonus scheme will be introduced if X, Y and Z becomes the managers are $\frac{3}{10}, \frac{1}{2}$ and $\frac{4}{5}$ respectively. (i) What is the probability that the bonus scheme has been introduced? (ii) What is the probability that the manager appointed was X?

VIII. If X has a continuous uniform distribution in $(0,\theta)$, write its (i) pdf (ii) distribution function and (iii) MGF and hence (iv) the mean and variance.

OR

IX. Define the geometric distribution. If X is geometric, then show that $P(X > s+t) = P(X > s)P(X > t), \forall s,t \geq 0.$

X. If $f(x) = ce^{-(x^2-6x+9)/32}, -\infty < x < \infty,$ represents the pdf of a normal distribution, find the value of c, the mean and variance of the distribution.

OR

XI. Write the inter relationships between the chi-square, student's-t and F-statistics.

XII If X and Y are normal random variables with means 2 a+b and 2a-b respectively and common variance σ^2, obtain the MLEs of a, b and σ^2.

OR

XIII. In a sample of 600 men from city A, it is found that 400 are smokers. In another sample of 900 men from city B, 450 are smokers. Does the data indicate that the cities significantly differ in the smoking habits of the people?

XIV. Explain the method of estimating the parameters in a linear regression model.

OR

XV. From the following information on the two variables X and Y, find the two regression lines and the correlation coefficient between X and Y, $n = 10$, $\sum X = 20$, $\sum Y = 40$, $\sum X^2 = 240$, $\sum Y^2 = 410$ and $\sum XY = 200$. Also estimate Y when X = 5.

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