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Total Number of Pages:02

MCA
MCC305

3rd Semester Back Examination 2016-17
PROBABILITY AND STATISTICS

BRANCH: MCA
Time: 3 Hours
Max Marks: 70
Q.CODE: Y718

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2x10)**

- A die is rolled and a coin is tossed, find the probability that the die shows an odd number and the coin shows a head.
- State Baye's theorem?
- What are the properties of expectation of a random variable?
- What is the probability that a leap year contains 53 Sundays?
- What is the difference between Point Estimation and Interval estimation?
- What is Standard Error?
- What is sampling distribution?
- Define one tailed and two tailed test.
- Define most efficient estimator of the parameter Θ .
- Define Type-I and Type-II Error

Q2 What is a probability distribution function? If X is discrete random variable having the following probability distribution **(2+8)**

x	0	1	2	3	4	5	6
$p(X = x_i)$	0	k	$6k^2$	$2k$	$3k$	$4k^2$	$3k$

Find (i) the value of k (ii) $p(x \geq 3)$ (iii) $p(1 \leq x \leq 4)$ (iv) $p(x < 2)$

Q3 a) Two random variables X and Y have joint density function **(5)**

$$f(x, y) = \begin{cases} (x^2 + \frac{xy}{3}), & 0 \leq x \leq 1, 0 \leq y \leq 2 \\ 0 & \text{otherwise} \end{cases}$$

Show that X and Y are not independent. Find the conditional density functions. Check whether the conditional density function is valid.

- b)** A typist was given an assignment to type 200 pages of a project report. It was found that the report contains 30 typing errors and the errors are randomly distributed. If 10 pages are selected at random, then find (i) there are zero errors (ii) between 1 and 2 errors? **(5)**

Q4 a) If X is normally distributed with mean 8 and standard deviation 4 then find **(5)**
(i) $p(5 \leq X \leq 10)$ (ii) $p(10 \leq X \leq 15)$ (iii) $p(X \leq 15)$

b) State and prove Chebyshev's Inequality (5)

Q5 a) What are the properties of variance of a random variable? Let X be a random variable with the following probability distribution. (5)

X	3	6	9
P(X=xi)	1/6	1/2	1/3

Find $E(X)$, $E(X^2)$, $Var(X)$ and $E[(1+2X)^2]$.

b) Consider a Poisson distribution with probability mass function: (5)

$$f(x) = \frac{e^{-\lambda} \lambda^x}{x!}, x = 0, 1, 2, 3, \dots$$

Suppose that a random sample X_1, X_2, \dots, X_n is taken from the distribution.

What is the maximum likelihood estimate of λ ?

Q6 a) The specimen of aluminum wires drawn from a large lot has the following breaking strength (in kg.weight): (5)

544,596,572,578,572,568,570,572,578,570.

Test whether the mean breaking strength of the lot may be taken to be 578kg.weight .Use 0.05 level of significance.

b) In an anti-malarial campaign in a certain area, quinine was administered to 812 persons out of a total population of 3248. The number of fever cases is shown below: (5)

Treatment	Fever	No Fever	Total
Quinine	20	792	812
No Quinine	220	2216	2436
Total	240	3008	3248

Discuss the usefulness of quinine in checking malaria.

Q7 The following are measurements of the air velocity(x) and evaporation coefficient(y) of burning fuel droplets in an impulse engine : (10)

X cm/sec	20	60	100	140	180	220	260	300	340	380
Y mm ² /sec	0.18	0.37	0.35	0.78	0.56	0.75	1.18	1.36	1.17	1.65

(a)Fit a straight line to these data by the method of least squares.

(b)Find regression equation of X on Y.

(c)Estimate the evaporation coefficient when the Air velocity is 210 cm/s.

(d)What should be the expected air velocity in case evaporation of 1.50 mm²/sec.

Q8 Write short answer on any TWO: (5x2)

a) Joint Probability distribution with properties

b) Weibull's Distribution

c) The Chi-square test for goodness of fit

d) Statistical Quality Control