LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - MATHEMATICS

SECOND SEMESTER – NOVEMBER 2013

MT 2905 - STATISTICAL APPLICATIONS

Date : 08/11/2013 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

Answer All Questions **(5 x 20 = 100)**

1. (a) If A and B are independent events then $\bar{A}$ and $\bar{B}$ are also independent events.

(b) If two dice are thrown, what is the probability that the sum is (i) greater than 8, (ii) neither 7 nor 11? **(6+14)**

(OR)

(c) The odds that person X speaks the truth are $3:2$ and the odds that person Y speaks the truth are $5:3$. In what percentage of cases are they likely to contradict each other on an identical point.

(d) A random variable X has the following probability function:

x	0	1	2	3	4	5	6	7
$p(x)$	0	k	$2k$	$2k$	$3k$	k	$2k$	$7k^2+k$

(i) Find k, (ii) Evaluate $p(X<6)$, $p(X\geq 6)$, and $P(0<X<5)$, (iii) if $P(X\leq k)>\frac{1}{2}$, find the minimum value of k, and (iv) Determine the distribution function of X. **(8+12)**

1. (a) The diameter of an electric cable, say X is assumed to be a continuous random variable with $p.d.f\ f(x)=6x(1-x), 0\leq x\leq 1$. (i) check that above is $p.d.f$. (ii) Determine a number b such that $P(X<b)=P(X>b)$.

(b) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads.

(c) Six coins are tossed 64,000 times. Using the Poisson distribution, find the approximate probability of getting six heads r times. **(8+6+6)**

(OR)

(c) State and prove addition theorem of probability.

(d) Determine the binomial distribution for which the mean is 4 and variance 3. Find its mode.

(e) A manufacturer of cotter pins knows that 5% of his product is defective. If he sells cotter pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality? **(8+6+6)**

2. (a) Find the mean and standard deviation for the following table giving the age distribution of 542 members.

Ages in yrs	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
No. of members	3	61	132	153	140	51	2

(b) Calculate (i) Quartile deviation (Q .D) and (ii) Mean Deviation (M.D) from meanfor following data:

Marks	:	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No of students	:	6	15	8	15	7	6	3

(8+12)

(OR)

(c) State the merits and demerits of mean.

(d) For a group of 200 candidates, the mean and standard deviation were found to be 40 and 15 respectively. Later on it was discovered that the scores of 43 and 35 were misread as 34 and 53 respectively. Find the corrected mean and standard deviation corresponding to the corrected figures.

(e) An incomplete frequency distribution is given as follows:

Variable	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	Total
Frequency	12	30	?	65	?	25	18	229

Given that the median value is 46. Determine the missing frequencies using median formula. **(4+8+8)**

3. (a) A computer while calculating correlation coefficient between two variables X and Y from 25 pairs of observations obtained the following result: $n = 25;\ \sum X = 125, \sum X^2 = 650, \sum Y = 100, \sum Y^2 = 460, \sum XY = 508$. It was however, later discovered at the time of checking that he had copied down two pairs as X while the correct values were

X	6	8
Y	14	6

Obtain the correct value of correlation coefficient.

X	8	6
Y	12	8

(b) Obtain the equations of the lines of regression for the following data.

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

Also obtain the estimate of X for Y=70. **(10+10)**

(OR)

(c) Obtain the rank correlation coefficient for the following data:

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

(d) State the properties of Regression Coefficients.

(e)In a partially destroyed laboratory record of an analysis of correlation the following results only are legible. Variance of X = 9. Regression equations:8 X – 10 Y + 66 = 0. 40 X – 18 Y = 214.What are (i) the mean values of X and Y (ii) The correlation coefficient between X and Y (iii) The standard deviation of Y? **(6+2+12)**

4. (a) Define Standard Error.

(b) A dice is thrown 9000 times and a trow of 3 or 4 is observed 3240 times. Show that he dice cannot be regarded as an unbiased one and find the time between which the probability of a throw of 3 or 4 lies.

(c) The theory predicts the propotion of beans in the four groups A, B, C and D should be 9: 3: 3: 1. In an experiment among 1600 beans, the number in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? **(2+8+8)**

(OR)

(d) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence, 200 men and 325 women were in favour of the proposal. Test the hypothesis that propotions of men and women in favour of the proposal, are same against that they are not, at 5% level.

(e) A sample analysis of examination results of 200 MBA 's was made. It was found that 46 students had failed, 68 secured III division, 62 secured II division, and the rest were placed in I division. Are these figures commensurate with a general examination result which is in the ratio 4: 3: 2: 1 for various categories respectively? ($\chi^2_{0.05}$ for 3, 4, 5 d.f are 7.815, 9.485, 11.07).

(8+12)