IC-104

Fellowship

EXAMINATION QUESTION PAPERS MAY 2005

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FL-82

FELLOWSHIP EXAMINATION
STATISTICS

Time: 3 Hours]   [Total Marks : 100

Answer any **FIVE** questions only.
All questions carry 20 marks each.

(An extract from the table of areas of the standard normal curve between o and x is given at the end)

Marks

1. A book (on technical subject) of 1000 pages was scanned and the number of printing errors in each page was noted. The distribution of number of errors in a page was found to be 'Poisson'. If there were exactly 223 pages free from errors and exactly 251 pages with 2 printing errors each, estimate the average errors per page. Also estimate :

    a) i)   the number of pages with exactly '4' errors and   12
        ii) the number of pages with exactly '5' errors

    b) If for second edition of the same book (of 1000 pages) after one   8
        year, the average errors per page was found to be 1.2, estimate

        i)   the number of pages with exactly '4' errors and
        ii) the number of pages with exactly '5' errors

    Assuming that the distribution of number of errors in a page still followed 'Poisson Distribution'.

    Given that $\bar{e}^{1.2} = 0.301$

2. The Table below gives the consumption of five popular brands of   20
    cold drinks in five cities, during the calendar year 2004.

    Consumption of cold drinks in '000s Bottles.

		I	II	III	IV	V
	A	32	26	32	26	33
Cities	B	38	20	32	28	29
	C	33	30	38	30	30
	D	29	27	26	24	31
	E	37	29	33	23	40

Construct the appropriate Analysis of Variance(ANOVA) table and test whether the consumption of 'cold drinks' varies significantly between :

i) Cities   ii) Brands

Given that $F_{0.05} = 3.01$ for 4 & 16 degrees of freedom.

2½ each

3.

Variable $x =$	0	1	2	3	4	5	6	7
Frequency $f =$	305	365	210	80	28	9	2	1

The above table gives the frequency against each value of variable 'x' for 1000 observations. Using the above data calculate in respect of variable 'x' the following:-

a) Mean   b) Mode   c) Median

d) Lower Quartile   e) Upper Quartile   f) Standard Deviation

g) Mean Deviation   h) The measure of skewness (α_s)

10 each

4. a) A variate x is distributed normally with mean 45.54 and standard deviation 14.71. Find the probability of x being between

  (i)   30 & 59   (ii)   15 & 74

b) A variate y is also distributed normally with mean 27 and standard deviation 9. Find the probability of y being between

  (i)   31.5 & 40.5   (ii)   9 & 40.5

5. Following are the quarterly expenses of electricity (expressed in thousands of rupees) of a company during 5 year period 2000 - 04.

Quarter ↓ Year →	2000	2001	2002	2003	2004	Total
I	45	48	49	52	60	254
II	54	56	63	65	70	308
III	72	63	70	75	84	364
IV	60	56	65	72	66	319
Total	231	223	247	264	280	1245

a) Calculate the trend value and isolate the random variations taking the following as the quarterly index estimated from past experience.   15

Quarter	I	II	III	IV
Seasonal Index	83.55	100.06	113.16	103.23

b) The regression equation of y on x is given by $y = (0.95) x + 7.25$, for the two variables x and y. If regression equation of x on y is given by $x = (0.95)y - 6.4$, find :   5

   i)   Co-efficient of co-relation between the two variables x and y.

   ii)   Average value of x, and

   iii)   Average value of y.

                                                       10 each

6.   a)   A card is drawn at random from a well shuffled pack of playing cards. The events x and y are defined as under:

   X →   The card drawn is King.

   Y →   The card drawn is Heart.

Find : $P_r(x)$, $P_r(Y)$, $P_r(x \cap Y)$, $P_r(x \cup Y)$ & $P_r(x/Y)$

Prove that X & Y are independent.

  b)   A bag contains six cubical dice. **Four** of them have faces marked 1, 2, 3, 4, 5, 6; **one** has faces marked 1, 1, 2, 3, 3, 4; while the other has faces marked 3, 3, 3, 4, 5, 6. A die is drawn at random from the bag and thrown on to a table.

   i)   What is the probability that it will come to rest with an upper most face marked 3?

   ii)   What is the probability that a die with faces marked 1, 1, 2, 3, 3, 4; is drawn?

7.   a)   A private Tuition class holds classes for S.S.C. students. Out of 1500 students enrolled in 'Regular Batch', 450 of them passed in 'First Class' at the S.S.C Examination in March 2004. Whereas, out of 1000 students enrolled in 'Vacation Batch', 350 of them passed in 'First Class' at the same examinations.   10

Test whether the difference in proportion of passing S.S.C. examination with 'First Class' is significant at 5% level, for the two types of classes.

b) i) Write short notes on 'F-distribution'. 6

ii) A random sample of 10 students from one college gave 4
mean height $\bar{x}_1 = 68$ inches and variance $s_1^2 = 4.5$ (inch)^2.
A random sample of 10 students from another college of
the same city gave mean height $\bar{x}_2 = 69$ inches and variance
$s_2^2 = 4.67$ (inch)^2.
Do the variances of the two samples differ significantly at
5% level of significance?

Given that $F_{0.05} = 3.39$ for degrees of freedom 9 & 8.

8. a) In a random sample of 90 employees of a company, 27 8
employees are found to be smokers.

i) Find 95 % confidence interval for the employees to be
smoker in that company.

ii) What should be the minimum sample size to be chosen
to be 95% confident that the proportion obtained from
the sample will not differ from the true proportion by
more than 0.04.

b) In connection with the construction of Index Numbers write
notes on the following:-
i) The purpose of the index 5
ii) The availability and comparability of data. 7

Table showing areas of the standard normal curve for values of X between O and X

X	Area	X	Area
0.1	0.0398	1.1	0.3643
0.2	0.0793	1.2	0.3849
Q.3	0.1179	1.3	0.4032
0.4	0.1554	1.4	0.4192
0.5	0.1915	1.5	0.4332
0.6	0.2257	1.6	0.4452
		1.645	0.4500
0.7	0.2580	1.7	0.4554
0.8	0.2881	1.8	0.4641
0.9	0.3159	1.96	0.4750
		2.00	0.4772
0.10	0.3413	2.58	0.4951

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