IC-104

Fellowship

EXAMINATION QUESTION PAPERS MAY 2008

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 gambler uses two types of biased dice. For type 'A' die, the probability of the face with number 'x' being on top (when thrown) is :

X	1	2	3	4	5	6
Probability	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

For type 'B' die, the probability of the face with number x being on top (when the die is thrown) is :

X	1	2	3	4	5	6
Probability	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{3}$	$\frac{1}{6}$

   i)   Two dice, one of type 'A' and one of type 'B' are thrown together. What is the probability that the sum of the number thrown up will be 7?   6

   ii) Two dice, one of type 'A' and one of type 'B' are thrown together n times. Show that, if a double six is to be obtained at least once, the minimum number of throws to be made in order to assure a probability of greater than $\frac{1}{2}$ is equal to 33.   6

   iii) A box contains 30 dice of Type 'A', 20 dice of type 'B' and 50 dice which are unbiased. Box is stirred well, a die is picked from it and thrown. If the face of the die shown up is 5, what is the probability that the die picked up is an unbiased die?   8

2. An agricultural experiment was conducted to test the effects of change of soil (5 blocks) and variety of wheats (7 different strains) on the yield of grains. Each block was divided into seven plots, and the plots of each   20

block were assigned at random seven varieties. The yield in quintals per acre are set out below in the rectangular array; columns corresponding to varieties and rows to blocks. Discuss the significance of the variation of yield with the two factors.

Blocks	Varieties						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I	39	45	42	42	51	45	48
II	33	33	30	30	45	27	36
III	30	39	36	45	42	39	39
IV	48	54	39	51	57	42	45
V	36	36	33	30	36	30	33

Given that: $F 0.05 = 2.78$ for degrees of freedom 4 & 24
               $F 0.05 = 2.51$ for degrees of freedom 6 & 24

Following are the quarterly expenses of electricity (expressed in thousands of rupees) of a company during five year period 2002-2006.

Quarter \ Year	I	II	III	IV	Total
2002	72	68	80	70	290
2003	76	70	82	74	302
2004	74	66	84	80	304
2005	76	74	84	78	312
2006	78	74	86	82	320
Total	376	352	416	384	1528

a) Calculate seasonal indicies by the method of 'Moving Averages'.   12

b) Derive the equation of trend line and show how you will obtain trend value for each quarter.   8

The distribution of heights of randomly selected 60 boys of a college are given in Table I and randomly selected 60 girls of the same college are given in Table II.

Table I (Boys)		Table II (Girls)	
Distribution of heights (in Cms) Mid-point of class interval (x)	**No. of boys** (f)	**Distribution of heights (in Cms)** Mid-point of class interval (x)	**No. of Girls** (f)
150	3	145	6
155	6	150	24
160	9	155	18
165	27	160	6
170	12	165	3
175	3	170	3
Total :	**60**	**Total :**	**60**

For each of the two distributions (given above) find :

a) Mean, Mode and Standard - deviation   12

b) i) Calculate :   4
   - Co-efficient of variation
   - Pearson's Co-efficient of skewness.
   ii) Give comments on your results.   4

5. a) A population consists of 4 units with values 2, 4, 5, 7 .   12
   Write all possible samples of size 2, assuming simple random sampling.
   i) With replacement
   ii) Without replacement
   Find mean $\overline{y}$ for all such samples and also find population mean $\overline{Y}$

   Verify that $E(\overline{y}) = \overline{Y}$

   b) Define the terms 'Convenience' sampling and 'sampling bias' . Also write   8
   your own comments as to any possible relationship between the two.

6. a) A Company manufactures badminton shuttles in such a way that there   10
   is on an average only one shuttle out of 50, is substandard. The
   Company has received a big order of 250 lots with 144 shuttles in
   each lot. Calculate expected number of lots in the consignment
   consisting of no substandard shuttle. (Given $\overline{e}^{2.88} = .05613$)

b) Three unbiased coins are tossed 800 times and following frequencies   10
were observed for x.

x = Number of heads in a single toss of 3 coins.

$x \rightarrow$	0	1	2	3
$f \rightarrow$	90	280	325	105

Find expected frequencies.

7. a) A study was made over a billing clerks activities and over a period   12
of time, following data was recorded.

X   Number of bills prepared per day

Y   Total time taken in minutes.

X →	75	70	77	75	75	74	66	78	69	81
Y →	282	308	283	290	296	276	330	283	319	290

Will you say there is posibility of linear relationship between X &
Y ? Give statistical reasons.

What is estimated total time if on any one day, the number of bills
prepared are (i) 72   (ii) 90 ?

b) Comment on the following :   8

   i)   There is no relationship between correlation coefficient and
regression coefficients.

  ii)   Correlation coefficient lies between −1 & +1

 iii)   If correlation coefficient between two variables is 0, they are
independent.

 iv)   Correlation coefficient is independent of change of origin and
scale.

8. a) From the following data, calculate price and quantity Index Numbers   12
by Fisher's formula.

Comodity ↓	Base year		Current Year	
	Price	Total value	Total expenditure	Quantity
1	12	600	2400	120
2	10	1000	960	80
3	14	840	1050	70
4	16	480	900	50
5	18	720	800	40
6	22	1540	900	60
7	20	1800	1600	100
8	15	1200	1440	80

Price in Rs. and quantity in kilograms for the entire data.

b) For the data available in the following table, construct cost of living Index for the year 2005 with base year 2001; using method of weighted price relatives.

8

Item	Unit	Price in Rs.		Weight
		2001	2005	
A	K.G.	50	75	10%
B	Litre	60	75	25%
C	Dozen	200	240	20%
D	K.G.	80	100	40%
E	one pair	160	200	5%

P. T. O.

TABLE SHOWING AREAS OF THE STANDARD NORMAL
CURVE FOR VALUE OF X BETWEEN 0 AND X

X	Area	X	Area
0.05	0.0199		
0.1	0.0398	1.1	0.3643
0.2	0.0793	1.2	0.3849
0.3	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
		1.9	0.4713
0.9	0.3159	1.96	0.4750
		2.00	0.4772
1.0	0.3413	2.58	0.4951
		3.0	0.4987

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