OCTOBER, 2010

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) Two unbaised dice are thrown. What is the probability that the product of numbers appearing on upper faces lies between 7 and 13 ? 10 each

   b) A manufacturing firm produces units of a product in four plants. Define event Ai as a unit is produced in plant i = 1, 2, 3, 4 and event B as unit is defective. From the past records of the proportions of defective units produced at each plant, the following conditional probabilities are set :

   Pr. (B/A_1) = 0.05, Pr. (B/A_2) = 0.10, Pr (B/A_3) = 0.15 and Pr. (B/A_4) = 0.02.

   The first plant produces 30 percent of the units of the product, the second plant 25 percent, third plant 40 percent and fourth plant 5 percent. A unit of the product taken randomly is tested and is found to be defective. Find the probability that the unit was produced

   i) in plant 1,

   ii) in plant 4.

2. a) A population of size 800 is divided into 3 strata. Their sizes and S. d. are given below : 8

Strata →	**I**	**II**	**III**
Size →	200	300	300
S. d. →	6	8	12

   A stratified random sample of size 120 is to be drawn from this population. Determine the sizes of samples from three strata in case of :

   i) Proportional allocation

   ii) Optimum allocation.

b) Write short notes on the following : 12
   i) Sampling bias
   ii) Multi stage sampling
   iii) Convenience sampling.

3. a) Calculate the seasonal indices using the method of moving average for the data given below: 12

Quarterly output of coal for four years (in '000 tons)

Year	Quarter I	Quarter II	Quarter III	Quarter IV	Total
2006	75	60	54	59	248
2007	86	65	63	80	294
2008	90	72	66	85	313
2009	100	78	72	93	343
Total :	**351**	**275**	**255**	**317**	**1198**

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

4. The following table shows the lives (in hours) of four batches of electric bulbs. 20

Batch	Life (in hours) of bulbs							
1	1600	1610	1650	1680	1700	1720	1800	-
2	1580	1640	1640	1700	1750	-	-	-
3	1460	1550	1600	1620	1640	1660	1740	1820
4	1510	1520	1530	1570	1600	1680	-	-

Perform an Analysis of Variance of these data and show that the batches are homogeneous at 5% and 1% level of significance.

Given $F_{.05} = 3.05$ and $F_{.01} = 4.82$ at 3 and 22 d.f.

5. a) Using the data given below, calculate the following indices for the year 2009 taking 2004 as base year.

	Year 2004		Year 2009	
Commodity	**Price**	**Quantity**	**Price**	**Quantity**
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	13

i) Simple Price Index 2
ii) Laspeyres' Price Index 3
iii) Paasche's Price Index 3
iv) Fisher's Price Index 3

b) Write short notes on the following :
i) Sampling Errors 6
ii) Non-Sampling Errors. 3

6. For the data given in the following Table :

a) Calculate the co-efficient of correlation between x and y. 8

b) Find the equation of regression line of y on x and estimate the value of y when $x = 10.5$ 6

c) Find the equation of regression line of x on y and estimate the value of x when $y = 15.5$ 6

Variable $x \rightarrow$	8	9	10	11	12	13	14	15	16
Variable $y \rightarrow$	15	15	16	19	17	18	16	18	19

10 each

7. a) The incidence of an occupational desease in an industry is such that the workers have a 20% chance of catching the desease. What is the probability that out of six workmen four or more will contact the desease?

b) The past experience suggests that 1.5% of the calls received at a telephone switchboard are wrong numbers. If 200 calls are received during each of randomly selected 50 weeks, find the expected number of weeks during which we expect x wrong number calls, where

$x = 1, 2, 3, 4,$ and 5

Given $e^{-1.5} = 0.2231$ $e^{-3} = .0498$

8. a) In a year there are 956 births in town A, of which 52.5% were males. In 10 each towns A and B combined, this proportion was 0.496 in a total of 1406 births. Is there is any significant difference in the proportion of male births in two towns? (Use 1% level of significance).

b) Five bolts drawn from the bolts manufactured by a certain machine have lengths 2.3, 2.28, 2.31, 2.33 and 2.28 c.ms. Find an unbiased estimate of the variance of the length of the bolts produced by the machine.

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

X	Area	X	Area
0.05	0.0199		
0.10	0.0398	1.1	0.3643
0.20	0.0793	1.2	0.3849
0.30	0.1179	1.3	0.4032
0.40	0.1554	1.4	0.4192
0.50	0.1915	1.5	0.4332
0.60	0.2257	1.6	0.4452
		1.645	0.4500
0.70	0.2580	1.7	0.4554
0.80	0.2881	1.8	0.4641
		1.9	0.4713
0.90	0.3159	1.96	0.4750
		2.00	0.4772
1.00	0.3413	2.58	0.4951
		3.0	0.4987

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