IC-104

Fellowship

EXAMINATION QUESTION PAPERS NOV.2007

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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)

1. a) Two Cards are drawn at random from a well shuffled pack of 52. Find the probability of drawing 2 aces. — Marks 2

   b) From each of the three married couples, one of the partners is selected at random. What is the probability of choosing two men and one woman? — 4

   c) A coin is tossed five times. What is the probability of getting at least one head ? — 4

   d) A bookcase has 3 shelves. The first shelf has 24 books of which 4 are with green cover. The second shelf has 16 books of which 4 are with green cover. And the third shelf has 8 books of which 4 are with green cover. A shelf is chosen at random and a book is selected at random from that shelf and found to be with a green cover. What is the probability that it came from the first shelf? — 10

2. a) Calculate correlation and regression co-efficients for the following data. — 10

X =	30	60	90	120	150	180	210
Y =	60	30	75	150	60	165	180

   b) Find the equations of regression lines. — 6

   c) Find the estimate of Y when X =195. — 2

   d) Find the estimate of X when Y = 120. — 2

3. a) A box contains 25 balls of which 15 are white and 10 are red. After shaking the box well, one ball is drawn at random, its color is noted and the ball is replaced in the box. The process is repeated 5 times. — 12

      i) What is the probability that on 2 occasions the ball drawn is white?

ii) What is the probability that the ball drawn is white on not more than two occasions?

iii) What is the probability that the ball drawn is red on not less than 4 occasions?

iv) What is the probability that the ball drawn is red on at least one occasion?

b) A die, with faces numbered 4,7,10,13,16 and 19 is rolled. If the random variable x is defined as the number coming up on the top, find the expected value and variance of x. 8

4. Eight lenses were selected at random from each of the five cases of lenses. The refractive index of each of the chosen lenses was measured. The refractive index of Lenses were as follows : 20

Case 1	Case 2	Case 3	Case 4	Case 5
1.503	1.516	1.507	1.523	1.520
1.521	1.525	1.521	1.520	1.517
1.522	1.520	1.528	1.511	1.506
1.513	1.508	1.518	1.517	1.511
1.499	1.519	1.515	1.522	1.514
1.512	1.500	1.513	1.520	1.521
1.524	1.522	1.514	1.523	1.510
1.519	1.522	1.518	1.517	1.499

Test whether the refractive index varies from case to case significantly, using the method of 'Analysis of Variance'.

Given that $F_{0.05} = 2.64$ for degrees of freedom 4 and 35.

5. a) Given below is the distribution of 140 candidates obtaining marks X or higher in a certain examination (All marks are given in whole numbers). 10

X	10	20	30	40	50	60	70	80	90	100
Cumulative Frequency	140	133	118	100	75	45	25	9	2	0

Find Mean, Median, Mode and Standard Deviation for the above distribution.

b) Four parts of a distribution are as follows : 10

Part	Frequency	Mean	Std. Deviation
1	50	61	5
2	100	70	10
3	120	80	12
4	30	83	8

Find the Mean and Std. Deviation of the complete distribution.

5. a) Two manufacturers of electric light bulbs presented their products (samples) for testing length of life of the bulb. Following data were obtained. 12

	Company A	Company B
Sample Size	$n_1=8$	$n_2=7$
Sample mean	$\bar{x}_1=1234$ hrs	$\bar{x}_2=1036$ hrs
Sample S.D.	$S_1=36$ hrs	$S_2=40$hrs

Company A Claims that their product has longer life than that of B. As a statistician will you agree with this claim? Derive your conclusion stating specific null hypothesis and alternative hypothesis.

Given : $t_{.05} = 1.77$ (13 d.f) for right tailed test .

b) In case of another company C, also manufacturing electric light bulbs, a sample of 16 bulbs was taken which gave average life of the bulb to be 1250 hrs. Population s.d. for Company C is known to be 32 hrs. 8

i) Find 90% confidence interval for the population mean.

ii) What should be minimum size of the sample, in order to be 90% confident that the difference between population mean and the sample mean will be less than 5 hrs.

7. a) State & explain in short, the four components of a Time Series. What classical assumption is made about the relationship between the components? 12

b) In case of time series data, if secular trend is believed to follow a straight line, state the equation of this straight line, by clearly defining variables and constants in the equation. 8

[You are expected to use Method of Least Squares]

If we choose mid point of the time frame as the origin, what is the effect on the constants?

P. T. O.

8. a) Find the missing value of y, if Laspeyres' and Paasches Index Numbers for price is the same for the following data : 5

	Base		Current	
Commodity	Price	Quantity	Price	Quantity
A	7	32	9	40
B	10	40	11	y

b) After finding y, calculate following Index Numbers for the same data. 10
   i) Value Index
   ii) Fishers Price Index
   iii) Laspeyres' Quantity Index
   iv) Paasche's Quantity Index.
   v) Fishers Quantity Index.

c) Explain the term 'Splicing' in connection with the theory of Index Numbers. 5

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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