

IC - 104

Fellowship

**EXAMINATION
QUESTION
PAPERS
NOV 2008**



भारतीय बीमा संस्थान
INSURANCE INSTITUTE OF INDIA
Universal Insurance Building,
Sir P. M. Road, Fort,
Mumbai - 400 001.

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 0 and x is given at the end)

- | | Marks |
|---|-------|
| 1. a) X chooses at random an integer from 1 to 9 (both inclusive), without knowing X's choice. Y chooses an integer from 1 to 9. What is the probability that the two numbers chosen do not differ by (i) more than 4 (ii) more than 5? | 14 |
| b) Two dice, each numbered 1 to 5 are rolled. What is the probability that the sum of numbers appearing on upper face is multiple of 4? | 6 |

2. a) In a village, total of 2010 farms were being studied for cultivation of rice. The farms were stratified into 7 strata, according to farm size. It was decided to select a sample of 150 farms from this population. Table below gives available data, where σ_i is std. deviation per stratum. Calculate sample size per stratum, by method of
- i) Proportion
 - ii) using std. deviation.

Stratum	Farm size in Acres	No. of farms	σ_i
1	0 - 40	394	8.3
2	41 - 80	461	13.3
3	81 - 120	391	15.1
4	121 - 160	334	19.8
5	161 - 200	169	24.5
6	201 - 240	113	26.0
7	More than 240	148	35.2
Total		2010	

- b) Write short notes on any two of the following:
- i) Judgement Sampling
 - ii) Cluster Sampling
 - iii) Systematic Sampling

3. The following are the marks obtained in statistics by 20 students in an examination :-

69	25	65	61	45	41	17	61	77	33
21	17	73	13	33	77	41	57	13	61

Calculate :-

- a) Mean, Mode and Median 6
 b) Standard Deviation, Mean Deviation (from Mean) 6
 c) Pearson's co-efficient of skewness and Measure of skewness \propto 3 8
4. a) The sales manager of an automobile dealer estimates that 90% of the new cars sold by them have no defects and hence will not be brought back immediately for repairs. He sells cars to an important customer. What is the probability that : 12
 i) No car will be brought back.
 ii) All cars will be brought back.
 iii) One or more cars will be brought back?
- b) An airline company from their previous experience know that approximately 3% of those who reserve plane ticket but fail to arrive at the flight time. As a result, the airline regularly sells 100 tickets for a flight in which there are 98 seats. What is the probability that the airline will oversell a flight? (Given $e^{-3} = .04979$) 8
5. a) A tea company appoints four salesmen, A, B, C and D and observe their sales in three seasons - summer, monsoon and winter. The figures (in lakhs) are given in the following table :- 12

Season	Salesmen				Season's Total
	A	B	C	D	
Summer	26	26	11	25	88
Monsoon	18	19	21	22	80
Winter	16	18	19	19	72
Salesmen's Total	60	63	51	66	240

Test whether the sales varies with (i) Salesmen (ii) Seasons. Given that $F_{0.05}$ for degrees of freedom 3 & 6 is 4.76 and for degrees of freedom 2 & 6 is 5.14

- b) Four salesmen were posted in different areas by a Company. The number of units of commodity X sold by them are as under :

Salesmen	No. of units of Commodity			
	A	20	23	28
B	25	32	30	21
C	23	28	35	18
D	15	21	19	25

Test whether the performance of salesmen varies.

Given that $F_{0.05} = 3.49$ for degrees of freedom 3 & 12.

6. a) For a certain commodity, a study was made over a number of years regarding monthly sales and following calculations were made.

$$\text{Trend : } y = 25.74 + 0.45(t)$$

Where y = Monthly Sales (million Rs.) and

t = Time units (one month).

Origin is at 31st Dec, 2004.

Seasonal Variations :-

Month :	Jan.	Feb.	March	April	May	June
Seasonal Index -	79	76	95	98	106	97
Month :	July	Aug.	Sept.	Oct.	Nov.	Dec.
Seasonal Index -	86	89	103	122	113	136

Estimate monthly sales for the year 2005, monthwise.

Use multiplicative model.

- b) In connection with time series data, explain clearly what is meant by the term, Secular Trend? Describe in short, different methods of determining the trend.
7. An Insurance company wishes to study the possible correlation between the heights and weights of a segment of their insured population. The observation on a random sample of 19 cases is given below :-

(Height in cms. and weight in kgs.)

Height :	167	152	165	158	153	168	162
Weight :	63	55	61	60	56	61	60
Height :	153	155	172	170	158	169	170
Weight :	58	55	69	69	61	63	58
Height :	154	167	171	172	152		
Weight :	56	60	66	72	56		

Mean value of height : 162 cms

Mean value of weight : 61 kgs.

- a) Find 'r' the correlation co-efficient between heights and weights. 10
 b) Find 95% confidence limits for ρ (rho), the population correlation co-efficient. 8
 c) Comment on the reliability of your estimate. 2

An extract from the table containing transformation from 'r' to 'z', where :

$Z = \frac{1}{2} \log_e \left(\frac{1+r}{1-r} \right)$ is given below :-

r	0.7148	0.8825	0.9542
z	0.897	1.387	1.877

8. a) Construct chain index numbers for the years 1998-99 to 2001-2002 from the following data :- 12

Year	Index Numbers of Wholesale Prices (1981-82 = 100)			
	Comodities			
	A	B	C	D
1998-1999	163.6	156.6	168.6	165.7
1999-2000	184.9	175.8	182.8	182.7
2000-2001	218.4	199.0	203.5	207.8
2001-2002	234.6	227.1	225.6	228.7

- b) What do you understand by the term 'Time Reversal Test' for an Index Number? Explain by giving example of any one formula in Index Number theory. 8

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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