MAY, 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)

1. Following data gives quality ratings for ten branches of an insurance company by five industry experts. Analyse data and discuss whether there is any significant difference between the branches or between the experts. Marks 20

Branches → / Experts ↓	1	2	3	4	5	6	7	8	9	10
A	99	70	90	99	65	85	75	70	85	92
B	96	65	80	95	70	88	70	51	84	91
C	95	60	48	87	48	75	71	93	80	93
D	98	65	70	95	67	82	73	94	86	80
E	97	65	62	99	60	80	76	92	90	89

Given :- F.05 for 9 & 36 degrees of freedom = 2.15
F.05 for 4 & 36 degrees of freedom = 2.63

2. a) An unbiased die numbered 1 to 6 is rolled. The three events E_1, E_2 and E_3 are defined as : 10 each

E_1 = appearance of 1, 2 or 3 on upper face,
E_2 = appearance of 2, 3 or 4 on upper face,
E_3 = appearance of 3, 4 or 5 on upper face.

Find P_r $\{E_1 \cup E_2 \cup E_3\}$ using 'the addition law' of probability.

b) In the case of 4 people of different ages (Say A, B, C and D), the probability of living for 10 years are respectively 0.5, 0.4, 0.3 and 0.2 . Calculate the probability that, of these 4 people, exactly 2 will live for 10 years.

3. For the data given in the following Table :

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

b) Find the equation of regression line of y on x and estimate the value of y when $x = 3$ 6

c) Find the equation of regression line of x on y and estimate the value of x when $y = 5$ 6

Variable $x \rightarrow$	2	3	4	5	6	7	7	8	8	9	10	11
Variable $y \rightarrow$	6	6	5	8	5	8	7	9	11	8	8	10

4. a) A firm selected a random sample of 100 items from its production line and obtained following data :- 12

Class interval	**Frequency**
130 - 134	3
135 - 139	12
140 - 144	21
145 - 149	28
150 - 154	19
155 - 159	12
160 - 164	5

Compute the following :-

i) Arithmatic mean

ii) Standard deviation

iii) α_3 (Measure of skewness)

b) The mean marks obtained by 300 students in an examination are 45 . The mean of top 100 students is 70 and the mean of last 100 students is 20. What is the mean of middle 100 students ? 8

5. a) Prices paid and quantities consumed for 3 commodities during two time periods are given in following table . 12

Commodity	**Base year 1990**		**Current year 1995**	
	Price	**Quantity**	**Price**	**Quantity**
A	10	2	15	1
B	15	3	10	3
C	20	4	15	4

i) Using the quantities in base year as weights, what change in prices has occurred between two time periods ? (Use Laspeyre's formula)

ii) What is the percentage change in prices if quantities in current year are used as weights ?

iii) What is the percentage change in quantities if prices in base year are used as weights?

iv) Calculate value index for above data.

b) Two price index series are given below . Splice them on the base year 2004 = 100 . By what percent did the price rise between 2000 & 2005 ? 8

Year →	2000	2001	2002	2003	2004	2005
Old price Index 1995 = 100	141.5	163.7	158.2	156.8	157.1	-
New price Index 2004 = 100	-	-	-	-	100	102.30

6. Following are the quarterly expenses of electricity (in thousands of rupees) of a company during five year period 2003 - 2007 .

Quarter → / Year ↓	Quarterly Expenses of Electricity				Total
	I	II	III	IV	
2003	10	13	14	12	49
2004	12	14	15	13	54
2005	13	15	18	14	60
2006	15	19	21	18	73
2007	15	22	23	20	80
Total	**65**	**83**	**91**	**77**	**316**

a) Derive the equation of trend line 7

b) Find the trend value of each quarter 5

c) The quarterly seasonal index estimated from past experience is given below: 8

Quarter	I	II	III	IV
Seasonal Index	89.7%	104.8%	112.7%	92.8%

Isolate random variations.

7. a) A variable x is distributed normally with standard deviation 7.8 . Given that 90 % of the cases are less than 40, find the mean of the distribution. 10 each

   b) A varite is distributed normally with mean 114.76 . Given that 30% of the cases are greater than 120, find the standard deviation of the distribution.

8. a) A sport club has membership of 1000 . It desires to estimate the average age of its members. A random sample of 16 members is taken and their ages are found as under : 10

   56, 49, 26, 59, 38, 42, 55, 53 33, 28, 31, 42, 27, 46, 29 & 46.

   The club desires to be 95% confident that estimated average age will not differ from actual age by more than 5 years.

   How many more samples will be required for the desired confidence level and precision specification ?

   b) Write short notes on F - distribution . 7

   c) How sampling bias occurs ? Give one example. 3

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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