

IC - 104

Fellowship

EXAMINATION QUESTION PAPERS NOV 2009



भारतीय बीमा संस्थान

INSURANCE INSTITUTE OF INDIA

Universal Insurance Building,

Sir P. M. Road, Fort,

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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) | <p>i) In a certain harbor there are 2 battleships, 3 cruisers, 5 destroyers and a submarine. Six of the commanding officers are invited to attend a cocktail party ashore. If all those invited and no others, attend, what is the probability that the guests represent 1 battleship, 2 cruisers, 2 destroyers and the submarine?
Assume that the eleven commanding officers are all equally likely to be invited.</p> <p>ii) What is the probability that all 5 destroyer commanding officers attend the party?</p> | 5

5 | | | | | | | | | | | | | | | | | | | | | | |
| | b) | 4 bags each contain 4 white and 7 black balls while one other bag contains 7 white and 4 black balls. A bag is chosen at random from the 5 bags and 2 balls are drawn out of it together and both are found to be black. What is the probability that it came from a bag containing 7 white and 4 black balls? | 10 | | | | | | | | | | | | | | | | | | | | | | |
| 2. | a) | <p>10 students are selected from a class at random and given two tests, one in the 'Mathematics' and one in 'Statistics'. Marks obtained by the students in two tests are given below:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr> <td style="padding: 2px;">% Marks in Mathematics</td> <td>85</td><td>77</td><td>41</td><td>71</td><td>56</td><td>76</td><td>48</td><td>91</td><td>53</td><td>62</td> </tr> <tr> <td style="padding: 2px;">% Marks in Statistics</td> <td>80</td><td>66</td><td>41</td><td>51</td><td>57</td><td>69</td><td>46</td><td>86</td><td>51</td><td>53</td> </tr> </table> <p>Find the co-efficient of correlation between the % marks obtained in the two subjects.</p> | % Marks in Mathematics | 85 | 77 | 41 | 71 | 56 | 76 | 48 | 91 | 53 | 62 | % Marks in Statistics | 80 | 66 | 41 | 51 | 57 | 69 | 46 | 86 | 51 | 53 | 10 |
| % Marks in Mathematics | 85 | 77 | 41 | 71 | 56 | 76 | 48 | 91 | 53 | 62 | | | | | | | | | | | | | | | |
| % Marks in Statistics | 80 | 66 | 41 | 51 | 57 | 69 | 46 | 86 | 51 | 53 | | | | | | | | | | | | | | | |
| | b) | <p>Find the mean \bar{x} & \bar{y} of the two variables x & y. Given that:</p> <p>a) The line of regression of y on x passes through the points (4,0) & (-14,3)</p> <p>b) The line of regression of x on y passes through the points (1,-1)</p> <p>c) Co-efficient of correlation between x & y is $-\frac{1}{2}$</p> | 10 | | | | | | | | | | | | | | | | | | | | | | |

3. a) A random variable X follows Poisson Distribution with mean 3. Find probabilities 10

i) $P(X = 0)$

ii) $P(X = 1)$

iii) $P(X \geq 2)$

Given $e^{-3} = 0.04979$

- b) An urn contains 6 white and 4 black bangles. One bangle is taken out, its color is noted and put back. Then another bangle is taken out. This process is repeated 4 times. Find the probability that exactly 2 bangles are white and 2 are black. 10

4. Three different methods M_1 , M_2 , M_3 are used to determine amount of certain component in a sample. Each method is used by 5 analyst and the results are tabulated below. Discuss the significance of variation in results as regards methods and analysts. 20

Given: $F_{05} = 4.46$ for degrees of freedom 2 and 8
 $= 3.84$ for degrees of freedom 4 and 8

Methods \rightarrow Analyst \downarrow	M_1	M_2	M_3
1	7.5	7.0	7.1
2	7.4	7.2	6.7
3	7.3	7.0	6.9
4	7.6	7.2	6.8
5	7.4	7.1	6.9

5. What is stratified random sampling? When will you use it as a preference over simple random sampling? What are the methods used for deciding optimum size of the sample for each stratum? 20

6. a) Work out the centered 4 yearly moving average for the following data. 8

Year	Tonnage of Goods Carried	Year	Tonnage of Goods Carried
1990	2204	1996	2904
1991	2500	1997	3098
1992	2360	1998	3172
1993	2680	1999	2952
1994	2424	2000	3248
1995	2634	2001	3172

- b) What are the four components of a time series data? Give a brief description of each. What kind of relationship is assumed between them in the classical analysis? 12

7. a) 11 students are selected from a class at random and given two tests, one in algebra and one in geometry. The marks obtained in the two tests are given below: 8

Algebra	23	20	19	21	18	20	18	17	23	16	19
Geometry	24	19	22	18	20	22	20	20	23	20	17

Test whether there is significant difference between the performances in Algebra and Geometry. Given that $t_{0.025}$ for 10 degrees of freedom is 2.228.

- b) The number of Policies lapsing after payment of first premium in respect of two Branches of Life Office is given below for the financial year 2008-09 12

Branch	No. of policies Issued	No. of Lapses
A	12,000	564
B	7,000	385

Test at 5% level, whether there is significant difference between the proportion of policies lapsing after payment of first premium.

8. Problems faced while constructing Index Numbers are generally classified in six groups. State and explain in brief all these groups of problems. 20

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

— END —