

**FELLOWSHIP EXAMINATION
STATISTICS**

Reg. No.

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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)**

- Q.1 a) i) What are the Errors in Approximation? (5 Marks Each)
 ii) What is Spurious Accuracy?
 b) The Life Fund of a Life Assurance Company doubled itself in 8 years. Find the average annual percentage increase.
 c) Define the Mid-Point of a Class-Interval. What is the meaning of Exact or True Limits of Class Interval?
 d) Construct a Histogram and a Frquency Polygon for the following data. Also, comment on the shape of the Frequency Curve.

Class-Interval	Frequency
10 to Under 20	9
20 to Under 30	7
30 to Under 40	10
70 to Under 50	6
50 to Under 60	13
60 to Under 70	18
70 to Under 80	15
Total	78

- Q.2 The staff in an office are classified on the basis of two aspects, i.e., Qualification and Confidential Rating. The classification is given in the table below. (5 Marks Each)

Qualification	Rating		
	Outstanding	Good	Average
Post-Graduate	200	125	75
Graduate	400	350	250
Non-Graduate	250	250	100

If an employee is selected at random out of total 2,000 employees, find the probabilities as below:

- a) Marginal probability that his rating is 'Outstanding'.

- b) Joint probability, that he is a 'Post-Graduate' and having a 'Good' rating.
- c) The conditional probability of his rating being 'Average' given that he is a 'Graduate'.
- d) Probability that he is a 'Non-Graduate'.

Q.3 a) Lives insured by 10 Life Assurance Advisors in their First Agency Year vis-a-vis (10 Marks)
 Marks secured by them in a Salesmanship Examination are given below :

S	Marks Secured in Salesmanship Examination	Lives Insured in First year
1	84	79
2	76	65
3	40	40
4	70	50
5	55	56
6	75	68
7	47	45
8	90	85
9	52	50
10	61	52

The Branch Head wants to decide the utility of the salesmanship Examination for insuring more lives. How would you help him in his decision-making?
 (Find a linear relationship connecting the two Outcomes and the coefficient of correlation between them.)

- b) (5 Marks Each)
 - i) Write a short note on 'Time Reversal Test'.
 - ii) Given :

Year	Index Numbers
2001	100
2002	117
2003	109
2004	107
2005	107
2006	130

If we shift the Base Year to 2004 from 2001, what will be the indices for the Years: 2001, 2002, 2003, 2004, 2005 and 2006?

Q.4 a) The heights in inches, of 6 randomly chosen Sailors and 10 randomly chosen Soldiers are as follows: 10 Marks each

Sailors : 63, 65, 68, 69, 71, 72

Soldiers : 61, 62, 65, 66, 69, 69, 70, 71, 72, 73

Test the hypothesis that the Soldiers are, on an average, taller than the Soldiers.

(Given $t_{.05} = 1.76$ for 14 d.f. - Single Tail Test)

b) x is a normal variate with mean = 30 and, s.d. = 5. Find the probabilities that:

i) $26 < x < 40$

ii) $x > 45$

Q.5 a) Following table shows age of cars of a certain make and corresponding annual maintenance costs. 10 Marks each

Age (Years) →	2	4	6	7	8	10	12
Annual Cost (Rupees) →	1,000	1,400	1,800	1,900	1,700	2,100	2,000

Find the regression equation for cost related to age. Hence, estimate approximate cost of maintaining 3-year-old car of same make.

b) Apply the theory of Binomial distribution to find the probability in the following cases:

It is observed that 40% of the students in a class wear glasses. If 5 students from this class are selected at random, find the probability that:

i) No one wears glasses.

ii) Exactly one student wears glasses.

Q.6 Four scientific research officers determine the moisture content in samples of a powder. (20 Marks)
Each one takes a sample from each of six consignments Their observations are recorded as under:

Consignments → Observers ↓	1	2	3	4	5	6
A	9	10	9	10	11	11
B	12	11	9	11	10	10
C	11	10	10	12	11	10
D	12	13	11	14	12	10

Carry out ANOVA and discuss whether there is any significant difference between consignments and between observers.

Table values: $F_{3,15(.05)} = 3.29$, and

$F_{5,15(.05)} = 2.90$

- Q.7 A social club of 50 members consists of 30 Self-Employed Professionals (who need to provide for their retirement, and hence the prospects to sell annuity policies), and 10 Employed Professionals (whose Employers have provided for their retirement, and hence the prospects to sell assurance policies), balance 10 members being retired persons. (20 Marks)
- What is the probability that a member, selected at random from this club will be either Self-Employed Professional or an Employed Professional?
- If 3 members are selected random from this club, what is the probability that:
- All 3 are Employed Professionals?
 - 1 is a Self-Employed Professional, and 2 are the Employed Professionals?
 - Neither of them is a Professional?
 - At least one of them is a Professional?

- Q.8 The 'Independent Life Assurance Agents of India' conducted a survey of Life Assurance Policyholders, and discovered that 48% of them always re-read their Life Assurance Policies, 29% sometime do, 16% rarely do, and 17% never do. (20 Marks)
- Suppose a large Life Assurance Company invests considerable time and money in re-writing policies so that they will be more attractive and easy to read and understand. After using the new policies for a year, company managers want to determine whether re-writing the policies significantly changed the proportion of policy holders who always re-read their Assurance Policy.
- They contacted 380 of the Company's Policyholders who purchased a policy in the past year and ask them whether they always re-read their Assurance Policies. 164 responded that they did. Use a 1% level of significance to test the hypothesis.

TABLE SHOWING AREAS OF THE STANDARD NORMAL CURVE FROM 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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