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MSTE–003

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination

December, 2025

MSTE-003 : BIOSTATISTICS—I

Time : 3 Hours *Maximum Marks : 50*

Note : *(i) Question No.* ***1*** *is compulsory.*

(ii) Attempt any ***four*** *questions from the remaining question nos.* ***2*** *to* ***7****.*

(iii) Use of scientific (non-programmable) calculator is allowed.

(iv) Use of Formulae and Statistical Tables, Booklet for PGDAST is allowed.

(v) Symbols have their usual meanings.

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1. State whether the following statements are True *or* False. Give reasons in support of your answers : 2×5=10

   (a) Tertiary prevention reduces complications and disabilities.

   (b) A double-blind trial eliminates all chances of bias.

   (c) Equality of intercepts is the basic requirement for the parallel-line-assay.

   (d) The quantal assay is applicable, when the response is severity of a disease at different doses.

   (e) To estimate q_x, we need population data on deaths.

2. (a) Describe the term 'dynamics' of population change. 3

   (b) Write a short note on uses of the vital statistics. 2

   (c) Describe direct and indirect methods of standardization of the rates. 5

3. The doses of three preparations, say A, B and C are recorded which cause death of the subjects as a result of a direct assay. The recorded doses are given in the following table : 10

Preparation A (in ml)	Preparation B (in ml)	Preparation C (in ml)
18.90	16.20	30.60
23.40	11.70	32.22
14.40	12.15	34.65
17.10	10.35	33.30
19.80	13.50	30.60

If we assume preparation A as a standard preparation and B and C as test preparations, then estimate the relative potency of B and C.

4. (a) Calculate GFR, ASFR and TFR from the data given ahead : 3

Age Group	No. of Women ('000)	Total Birth
15—19	15.0	250
20—24	16.2	2243
25—29	15.8	1897
30—34	15.2	1320
35—39	14.8	915
40—44	15.0	280
45—49	14.0	145

Assume that the proportion of female birth is 45.2 percent.

(b) Calculate standardized death rate from the following data : 3

Age	Standard Population ('000)	Population ('000)	No. of deaths ('000)
< 10	20	12	300
10—20	12	20	600
20—40	60	64	1600
40—60	20	25	500
> 60	10	3	150

(c) Suppose it is known that an established diagnostic test for typhoid provides correct diagnosis in 62% subjects. Another diagnostic test is devised and tried on 30 subjects for non-inferiority. This provides correct diagnosis in 19 subjects. Can it be concluded that the new diagnostic test is not inferior to the established diagnostic test ? The non-inferiority margin is only 1%. 4

5. (a) Define the levels of disease prevention. 5

(b) Write down the advantages and disadvantages of cross-sectional study. 5

6. (a) Computerised Axial Tomography (CAT) test is applied to 200 cases of brain tumor and 80,000 healthy persons having no brain tumor at all. The result of the test is shown as follows : 5

		Brain Tumor Status		
		Present (D^+)	Absent (D^-)	Total
Result of CAT test	T^+	195	4,000	4,195
	T^-	5	76,000	76,005
	Total	200	80,000	80,200

What are the sensitivity and specificity of the CAT test ?

(b) Consider hypothetical data (given as follows) collected at a point of time in a particular area : 5

	Have cancer	Do not have cancer	Total
Smokers	30	90	120
Non-smokers	25	155	180
Total	55	245	300

What is the measure of association between smoking and cancer in that particular area at that point of time ?

7. (a) In a town with mid-year population of 1,40,000, there were 5,200 births of which 160 were still births. During the same year, 540 babies were reported to have died less than one year of age and 324 of them were under one month of age.

Calculate : 4

(i) Neonatal Mortality Rate

(ii) Post-Neonatal Mortality Rate

(iii) Infant Mortality Rate

(iv) Still Birth Rate.

(b) Explain the following : 6

(i) Quantal bioassay

(ii) ED_{50} and LD_{50}

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