POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination
December, 2023
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.*

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

    (a) If a new test applied on 1500 people, which results into 45 test positives and 1455 test negatives, the sensitivity of new test is 97%.

P. T. O.

(b) In clinical trials an active control is the one that works in a large percentage of cases.

(c) The end of the clinical phase of disease is marked by the point in time when signs and symptoms of the disease develop.

(d) In bioassay one of the components is subject, where subject means human being only.

(e) A life table based on one year age interval is called abridged life table.

2. (a) Explain design and analysis of data of case control study in detail.   8

(b) A case control study was conducted to determine the role of diethylstilbestrol (DES) administration to women on pregnancy in the causation of vaginal adenocarcinoma in female offspring. It was found that 7 out of 8 cases have history of maternal exposure to DES while a similar history was obtained in only 1 out of 32 controls. Construct a 2 × 2 table to represent this information. Also calculate the appropriate measure of association.   2

3. (a) An established diagnostic test for typhoid provides correct diagnosis in 62% subjects. A new diagnostic test is devised and tried on 30 subjects for non-inferiority, which provided correct diagnosis in 19 subjects. Can we conclude that the new diagnostic test is not inferior to the established diagnostic test ? The non-inferiority margin is only 1%.   5

    (b) In clinical trials one of the statistical ethics is blinding and masking. Explain it in detail.   5

4. Explain the role of bias, confounding and chance in epidemiology studies in detail. 4+4+2

5. (a) A life table with two years age returns with certain missing values is given as follows :   5

Age (years)	9	10
l_x	75824	75362
d_x	?	418
q_x	?	?
p_x	?	?
L_x	?	?
T_x	5028788	?
e_x^0	?	?

Complete the above life table using the relationship of unknown terms with available terms.

P. T. O.

(b) With the help of the following data of a country in the year 1961, determine the crude death rate and age specific death rates : 5

Age (in years)	Population (in '000)	Number of Deaths
0	58.30	1416
1—4	214.20	330
5—9	246.80	153
10—19	387.90	264
20—29	293.50	364
30—39	307.90	487
40—49	277.80	990
50—59	216.70	1976
60—69	151.00	3547
70—79	99.90	5958
80 and above	31.80	4816
Total	2285.80	20301

6. (a) To study the effectiveness of a new test insecticide, an assay was set up in which 4 doses each of standard and test

insecticides were applied on different number of insects. The total number of insects killed by different doses of both insecticides are recorded as follows :   6

Dose (di)	Standard Insecticide				Test Insecticide			
	Dose 1 (5 gm)	Dose 2 (10 gm)	Dose 3 (15 gm)	Dose 4 (20 gm)	Dose 1 (5 gm)	Dose 2 (10 gm)	Dose 3 (15 gm)	Dose 4 (20 gm)
x_i	1.6094	2.3026	2.7081	2.9957	1.6094	2.3026	2.7081	2.9957
n_i	20	26	30	24	11	16	23	25
r_i	2	12	18	17	2	9	16	21
p_i	0.1000	0.4615	0.6000	0.7083	0.1818	0.5625	0.6957	0.8400

Determine the value of LD_{50} for the standard and test insecticides graphically.

(b) Differentiate between direct and indirect bioassays.   4

7. (a) Write steps involved in probit method for a quantal assay.   5

(b) The number of births occurring in a country in 1958 is shown here classified according to age of mother, together with the female population in each age group of the child bearing period :   5

Age	Female Population (in '000)	Number of Births
15—19	84.79	2343
20—24	70.01	14541
25—29	72.66	16736
30—34	75.92	10218
35—39	75.10	5134
40—44	71.62	1422
45—49	66.66	93
Total	516.66	50487

The total population of a country in 1958 was 2285.8 thousand. With the information available in this table, determine :

(i)   the CBR

(ii) the GFR and

(iii) the ASFR for that country in 1958.