MSTE-003

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)

Term-End Examination
June, 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.*

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

   (a) In usual notations, we have

   $$\delta = 0.06, \pi_1 = 0.70, \pi_2 = 0.82, \bar{\pi} = 0.76,$$
   $$\alpha = 0.05, \text{ and } \beta = 0.20$$

   Then sample size for the clinical trial is 469.

(b) All clinical trials are randomised and un-controlled.

(c) The value of odds lies in the interval $[-1, 1]$.

(d) In order to study population dynamics, we have to consider only fertility.

(e) One of the basic requirements for a slope-ratio assay is "Dose levels must be equi-spaced".

2. (a) Explain design and analysis of data of Cohort study. 8

(b) Consider the following hypothetical data of a cohort study to assess the effect of obesity with adverse pregnancy outcomes :

	Pre-term Birth		
	Yes (D$^+$)	No (D$^-$)	Total
Obese (E$^+$)	16	35	51
Non-obese (E$^-$)	46	487	533

Determine relative risk among obese and non-obese women in giving birth to pre-term body. Also interpret the result. 2

3. (a) Suppose a decline of at least 10 mg/dL in triglyceride level (TGL) after a therapy is considered clinically important. It is proposed that a group of non-vegetarian obese and non-obese subjects kept on

vegetarian diet to see if their triglyceride levels decline by the clinically important magnitude. The SDs of their TGL are estimated to be 15.7 and 12.5 mg/dL, respectively. The researchers wish to detect a 10 mg/dL difference with probability 0.80. What sample size should be chosen if the level of significance is 0.10 ? Further, assume that resources permit to take $n = 100$ and if $\delta = 5$, then what is the probability to detect a 5 mg/dL difference.   5

(b) Suppose Regimen-A is considered equivalent to Regimen-B if the difference in their efficacy is 5%. A trial on 80 patients of Regimen-A revealed efficacy of 62% and on 120 patients of Regimen-B revealed efficacy 65%. Can they be considered clinically equivalent at 5% level of significance ?   5

4. Describe the various columns of a life table.   10

5. What are the different types of bioassays ? Describe each type in detail.   10

6. (a) Dexamethasone Suppression Test (DST) is applied on 293 cases of depression and 207 healthy persons having no depression. The results of the test are shown as follows :

		Depression Status		
		Yes (D⁺)	No (D⁻)	Total
Result of DST	T⁺	114	6	120
	T⁻	179	201	380
	Total	293	207	500

What are the sensitivity and specificity of the test ? Also determine the positive and negative predictive values of the test.　　5

(b) Write a note on need of a clinical trial (in **500** words).　　5

7. The following data show the responses recorded for 3 dose levels of a standard preparation and 4 dose levels of a test preparation as a result of a parallel-line bioassay :

	Dose (Unit/hg)						
	Standard Preparation			Test Preparation			
	4	7	10	4	6	10	15
Response	30	46	55	43	57	78	82
	32	42	58	50	62	70	84
	25	44	57	46		75	88
	28		56			72	

For the given data, determine the dose-response regression models for both preparations.　　10

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