MSTE-004

POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST)
Term-End Examination
June, 2023
MSTE-004 : BIOSTATISTICS—II

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 calculator (non-programmable) 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) For the following data, the odds ratio will be 2 :

	Case	Control
Exposed	400	250
Unexposed	600	750

(b) For a data, if $\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 = 30$ and

$\sum_{i=1}^{n}(y_i - \bar{y})^2 = 500$, the coefficient of

alienation is 0.94 in regression modelling.

(c) We use linear combination method to obtain the maximum likelihood estimators of the coefficients of logistic model.

(d) The hazard ratio should be increasing with time.

(e) If $\text{cov}(\varepsilon_i, \varepsilon_j \mid x_i, x_j) = 0$ in a regression analysis, it is known as condition of homoscedasticity.

2. A study was conducted to compare two diagnostic methods say, Method-I and Method-II. The following table shows the classification of the presence of infection on 5-point Likert Scale (none, mild, moderate, severe and extreme) :

Method-II	Method-I				
	None	Mild	Moderate	Severe	Extreme
None	89	5	16	2	4
Mild	36	3	15	6	2
Moderate	20	4	22	6	1
Severe	14	2	37	18	16
Extreme	4	1	16	23	50

Compute simple and weighted Kappa Statistic(s) to compare both methods.   10

3. To study the relationship between age (in years) and cholesterol level (in mg/dL) of two groups of patients, the following data were recorded :

Group 1

Age	46	52	39	65	54
Cholesterol	186	218	182	241	224
Age	49	76	71		
Cholesterol	193	262	240		

Group 2

Age	20	33	78	51	43	44	63
Cholesterol	208	248	335	264	242	268	315

Fit the multiple regression model. Also obtain the regression models for each group separately. 10

4. The data regarding amount of dose (x_i), total number of patients received medicine (n_i) and number of cured patients (y_i) are recorded in the following table :

S. No.	x	n	y
1	5	24	60
2	10	18	48
3	15	12	40
4	20	20	80
5	25	26	104

Fit a logistic model considering initial values of $\hat{\beta}_0 = -0.2$ and $\hat{\beta}_1 = -0.04$ up to only one iteration. 10

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5. To understand the pattern of relapse of tumours, a study was conducted on 10 patients. The study continued till all cases relapsed. The data are given in the following table :

Participant ID	Relapse Time (in month)
2001	3
2002	6
2003	15
2004	12
2005	9
2006	5
2007	3.5
2008	7
2009	10
2010	5

Estimate the survival function, cdf, pdf and hazard function.

Also plot the survival curve. 10

6. (a) Explain different types of censoring with examples. 6

(b) Differentiate between coefficient of determination and adjusted coefficient of determination. 4

7. (a) Differentiate between Chi-square tests for association and homogeneity of proportions. 5

(b) Describe Poisson regression model with a suitable example. 5

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