

No. of Printed Pages : 5

MSTE-004

**POST GRADUATE DIPLOMA IN
APPLIED STATISTICS (PGDAST)**

Term-End Examination

June, 2024

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 : $5 \times 2 = 10$

- (a) A diagnostic test whose sensitivity and specificity were 96% and 98%, respectively, was applied to test a disease for which the prevalence was 5.25%. If a patient has a positive test, the probability of presence of disease is 0.727.

P. T. O.

- (b) If a categorical regressor variable has 5 categories, we define 5 indicator variables for fitting a regression model.
- (c) The Probit model is fitted in case of count response variable.
- (d) The events which cause the occurrence of the primary event of interest are called competing events.
- (e) If the coefficients of simple logistic model are given as :

$$\hat{\beta}_0 = -3.5 \text{ and } \hat{\beta}_1 = 0.15$$

then the odds of occurrence of response variable ($y = 1$) will be 2.117 times as the value of regressor variable increases by 5 units.

2. To compare a diagnostic test conducted by two radiologists to test the severity of bones disorders, the following data were recorded :

Radiologist II	Radiologist I			
	None	Mild	Moderate	High
None	50	10	8	5
Mild	10	25	15	8
Moderate	8	9	34	12
High	14	6	20	16

Obtain weighted Kappa statistics and interpret the result.

3. The Systolic Blood Pressure (SBP), weight (in kg) and gender (0 for male and 1 for female) of 12 patients are given in the following table :

S. No.	SBP	Weight (kg)	Gender
1	150	60	0
2	270	82	0
3	210	76	0
4	110	56	1
5	320	90	1
6	170	70	1
7	270	90	1
8	270	82	0
9	230	74	0
10	300	87	1
11	170	72	1
12	110	44	1

- (i) Fit a multiple regression model.
- (ii) Estimate the standard error of the residuals.
- (iii) Obtain the linear regression model for each gender separately.

10

4. For the following fitted logistic model :

$$\hat{\pi} = \frac{1}{1 + \exp(3.5 - 0.07X)}$$

given that $n = 105$, $SE(\hat{\beta}_0) = 1.4$, $SE(\hat{\beta}_1) = 0.04$,
 $(\log L)_F = -64.7$ and $(\log L)_F = -66.8$:

- (i) Test the significance of β_1 at 5% level of significance using Wald Z-statistics.
 - (ii) Compute the 95% confidence interval of β_D and β_1 .
 - (iii) Compute the McFadden and Cox and Shell pseudo R^2 . 10
5. (a) A hypothetical study was conducted on ten participants who were followed up for the development of coronary heart disease (CHD) over a period of 10 years. The recorded data are given as follows :

Participant ID	CHD Time
P1	5
P2	8
P3	2
P4	6+
P5	9
P6	6
P7	10+
P8	4
P9	8
P10	4+

Estimate the survival function using the K-M method. 7

- (b) Explain the Kaplan and Meier method of estimation with example. 3
- 6. (a) Differentiate between the different types of censoring with examples. 6
- (b) Explain the coefficient of determination and adjusted coefficient of determination. 4
- 7. (a) Write a short note on the polytomous logistic model. 6
- (b) Mention the assumptions of Chi-square test for homogeneity of proportions. 4