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MST-025

M. SC. (APPLIED STATISTICS)

(MSCAST)

Term-End Examination

December, 2025

**MST-025 : CATEGORICAL AND SURVIVAL
ANALYSIS**

Time : 2 Hours

Maximum Marks : 25

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

(ii) *Attempt any **two** questions out of the remaining question nos. 2 to 4.*

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

(iv) *Symbols have their usual meanings.*

1. Answer the following : 1+2+2

(a) When should we apply the Fisher's exact test instead of Chi-square test ?

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- (b) What is the difference between the survival function and hazard function ?
- (c) Explain the purpose of the ROC curve in evaluating a diagnostic test.
2. In a clinical trial, the following data were obtained to assess the effectiveness of a vaccine with respect to a disease : 10

	Not Cured	Cured	Total
Vaccine	160	1840	2000
No Vaccine	439	1061	1500

- (i) Determine the relative risk to assess the effectiveness of a vaccine.
- (ii) Compute 95% confidence interval and test the significance of the relative risk.
- [Given that : $\chi^2_{(1), 0.05} = 3.84$]
3. A group of patients were randomized for receiving standard (Say 1) and new treatments (Say 2) for a particular disease. The survival data of those patients who were followed for 72 days are given as follows :

Patient No.	Survival Time (in days)	Outcome	Treatment
1	2	Died	2
2	4	Died	2
3	5	Died	2
4	6	Unknown	1
5	9	Died	2
6	9	Unknown	2
7	12	Died	2
8	12	Died	1
9	15	Unknown	2
10	15	Unknown	1
11	22	Died	2
12	30	Died	1
13	37	Died	1
14	55	Died	1
15	72	Survived	1

Test whether there is a significant difference between the survival times of the patients under standard and new treatments at 5% level of significance. 10

[Given that : $\chi^2_{(1), 0.05} = 3.84$]

4. (a) Two different diagnostic tests (Test-I and Test-II) were applied on 300 men/women to test the lung cancer. The following table provides the classification as positive (+) for diseased and negative (–) for non-diseased cases :

Diagnostic Test-II	Diagnostic Test-I	
	+	–
+	193	9
–	15	83

Obtain Kappa statistic and interpret the strength of agreement. 5

- (b) Explain the design and data structure of a randomized controlled trial in a survival analysis. 5

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