POST GRADUATE DIPLOMA IN APPLIED STATISTICS (PGDAST) / MASTER OF SCIENCE (RENEWABLE ENERGY AND ENVIRONMENT) (MSCRWEE)

Term-End Examination

December, 2022

MST-001 : FOUNDATION IN MATHEMATICS AND STATISTICS

Time : 3 hours   *Maximum Marks : 50*

Note :

(i)   *Question no. **1** is **compulsory**.*

(ii)   *Attempt any **four** questions from the remaining Questions No. 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)   All possible orders of a matrix having 8 elements are 4×2 and 2×4.

(b) Cardinality of the power set of the set

A = {α, β, γ, a, b, c} is 12.

(c) $\int_{3}^{5} (x-4)^2 \, dx = \dfrac{2}{3}$

(d) Histogram has more information about individual observations compared to stem-and-leaf plot.

(e) In vertical bar diagram y-axis may be started from any value other than zero.

2. (a) Check the continuity of the function

$f(x) = |x-2|$ at $x = 2$.   *4*

(b) Evaluate :   *4*

$$\lim_{x \to 2} \frac{x^3 - 7x^2 + 16x - 12}{x^4 - 6x^3 + 52x - 3x^2 - 60}$$

(c) Evaluate :   *2*

$$\lim_{x \to 2} \frac{\sqrt{3+x} - \sqrt{5}}{x-2}$$

3. (a) Find local maximum and minimum values of the function $f(x) = 4x^3 - 21x^2 + 18x + 9$.   *4*

(b) Evaluate : *4*

$$\int \frac{x^3 + 5x + 1}{x^2 - 4} \, dx$$

(c) Prove that *2*

$$\int_0^5 | x^2 - 3x + 2 | \, dx = \frac{29}{2}.$$

4. (a) Solve the given set of equations using matrix method : *4*

$$2x + 3y = 5, \, 4x + 6y = 10$$

(b) What are different types of data ? Explain each one of them with the help of example. *6*

5. Write ten guidelines to improve the quality of the questionnaire with proper example of each. *10*

6. (a) Draw a suitable diagram to represent the following data : *4*

Item	Company A	Company B
Selling price	9500	8000
Raw material	5500	6500
Direct wages	3500	4000
Rent of office	1500	1500

(b) Plot a suitable graph to find the shape of the distribution of the following data : *4*

120, 128, 131, 122, 128, 122, 121, 117, 121,
128, 126, 121, 128, 114, 116, 121, 115, 121,
122, 125, 137, 117, 112, 113, 113, 121, 119,
131, 120, 116, 122, 117, 118, 119, 117, 120,
125, 124, 116, 124, 117, 114, 121, 128, 120,
133, 138, 117, 119, 121, 114, 105, 130, 106,
120, 117, 122, 109, 125, 125, 116, 130, 103,
121, 117, 132, 124, 108, 116, 110, 124, 131,
129, 111, 119, 127, 110, 132, 128, 122, 133,
121, 124, 114, 126, 121, 119, 108, 120, 108,
112, 118, 130, 107, 116, 121, 121, 122, 114,
119

(c) Write down the four advantages of box plot. *2*

7. (a) In how many ways can 3 prizes be distributed among 5 students so that no student gets all the prizes ? *2*

(b) Use the inclusion-exclusion principle to find the number of integers from the set {1, 2, 3, 4, ..., 100}, that are not divisible by the numbers 2, 3 and 5. *4*

(c) A truck transports 500 kg of cement to a market. The quantity of the cement that the truck transports increases by 20% every day. Assume that there are 7 working days in a week and obtain the total quantity of cement that the truck transports in a week to the market. *4*