

Birla Institute of Technology & Science, Pilani, Pilani Campus – Rajasthan
Mid-Sem (Closed Book) ECON F 213 [Mathematical & Statistical Method]

Maximum Marks: 70

Time Duration: 90 Minutes

Dated: 4/Nov/2022

Instructions:

- Read the questions thoroughly before answering. All questions are compulsory. Start each question on a new page.
 - Calculation(s) to arrive at the result(s) and its Interpretation are necessary to get marks.
 - Calculator is allowed.
 - Make sure that you have correctly mentioned your Name, ID, Course, and other details on your answer sheet.
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Question 1: In an exactly normal distribution, 7 percent of the items are under 35, and 89 percent of the items are under 63. What are the mean and standard deviation of the distribution? [The value of standard normal variate corresponding to 43 percent area is 1.48 and the same value corresponding to 39 percent is 1.23]. **[10 Marks]**

Question 2: The Mean and Standard Deviation of a set of 200 observations are found to be 60 and 20 respectively. By mistake, two values were wrongly taken as 3 and 67 instead of 13 and 17 which wrongly estimate the value of the coefficient of variation. Calculate the correct value of the coefficient of variation and compare the result with the incorrect value and explain the reason behind the difference and its statistical significance. **[10 Marks]**

Question 3: The following data represent the number of units of production per day turned out by five different workers using four different types of machines:

		Machine Type			
		A	B	C	D
Workers	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

- a) Test whether the average production is the same for the different machine types?
- b) Test whether the five workers differ with respect to average production?

[Choose correct table values to compare and conclude: $F_{0.05(5,20)} = 2.71$; $F_{0.05(4,20)} = 2.86$; $F_{0.05(3,12)} = 3.49$; $F_{0.05(4,12)} = 3.25$] **[15**

Marks]

Question 4: A manufacturing firm produces computer chips in three plants with daily production volumes of 500, 1000, and 2000 units respectively. The past experience reports that the fractions of defective output produced by three plants are 0.005, 0.008, 0.010 respectively. In an inspection day, a chip is selected from the day's total production and found defective. Find out:

- a) From which plant the selected chip comes?
- b) What is the probability that it came from the first plant?

[10 Marks]

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Question 5: Assume that there are three sectors. The initial coefficient matrix A and the final demand vector d is given as follows.

$$A = \begin{bmatrix} 0.3 & 0.4 & 0.2 \\ 0.2 & 0 & 0.5 \\ 0.1 & 0.3 & 0.1 \end{bmatrix} \quad d = \begin{bmatrix} 100 \\ 30 \\ 30 \end{bmatrix}$$

Would the amount of the primary input required be consistent with what is available in the economy? **[5 Marks]**

Question 6: If the utility function of an individual takes the form as:

$$U = u(x_1, x_2) = (x_1 + 2)^2(x_2 + 3)^3$$

Where U is the total utility and x_1 and x_2 are the quantities of two commodities consumed. **[2+3+3+2=10]**

- Find the marginal-utility function of each of the two commodities.
- Find the value of the marginal utility of the first commodity when 3 units of each commodity are consumed.
- Find the Marginal Rate of substitution for x_1 and x_2
- What is the economic interpretation of Marginal Rate of substitution for x_1 and x_2 ?

Question 7: Given the following model:

$$Y = C + I_0 + G_0$$

$$C = a + b(Y - T) \quad (a > 0, 0 < b < 1)$$

$$T = d + tY \quad (d > 0, 0 < t < 1), \text{ where, } T = \text{Income tax and } t = \text{income tax rate}$$

- How many endogenous variables are there and why?
- Find the equilibrium level of Income (Y) and consumption (C) by using the matrix inverse method. The other variables used here have their own usual economic meaning.
- What restriction on the parameters is needed for a solution to exist? **[2+5+3=10]**

*******All the Best*******