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

Maximum Marks: 60   **Time Duration**: 90 Minutes
Instructions: **Dated**: 10/Oct/2023

- Read all the questions thoroughly before answering. All questions are compulsory. All parts of the questions should be answered sequentially and together. Start each question on a new page.
- Calculation(s) to arrive at the result(s) and its interpretation are necessary to get marks.
- A non-programmable calculator is allowed.
- While calculating, use two points after decimal without rounding off.
- Overwritten/ambiguous answers will not be evaluated. The exchange of calculators is not permitted.
- Please use a pen only while answering the question and drawing the graphs.
- Ensure you correctly mention your Name, ID, Course, and other details on your answer sheet.

Q1: Five doctors each test five treatments for COVID-19 and observe how many days each patient takes to recover—the results in terms of recovery time in days are given in the following table. Discuss the difference between the doctors and treatments at a 5 percent significance level.   **[15M]**

<table>
<tr><td colspan="6" align="center">Treatments</td></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr>
<tr><td>1</td><td>10</td><td>14</td><td>23</td><td>18</td><td>20</td></tr>
<tr><td>2</td><td>11</td><td>15</td><td>24</td><td>17</td><td>21</td></tr>
<tr><td>3</td><td>9</td><td>12</td><td>20</td><td>16</td><td>19</td></tr>
<tr><td>4</td><td>8</td><td>13</td><td>17</td><td>17</td><td>20</td></tr>
<tr><td>5</td><td>12</td><td>15</td><td>19</td><td>15</td><td>22</td></tr>
</table>

(Doctors label on left side rows 1–5)

[Choose correct table values to compare and conclude: $F_{0.05(4,16)} = 3.01$; $F_{0.05(5,25)} = 4.49$; $t_{0.05(4)} = 2.77$; $t_{0.05(24)} = 2.06$]

Q2: Based on your knowledge gained in the course related to index numbers, answer the following:
a) The index of a basket of goods is at 100 in the year 2001. It rises 4% in 2002, falls 6% in 2003, falls 4% in 2004, and rises 3% in 2005. Calculate the index numbers for the five years with 2003 as the base.   **[5M]**

b) The following data shows the average wages in rupees per week (Wages) of a group of agricultural laborers from 2000-2007. The consumer price indices (CPI) for these years, with 2000 as a base, are also shown:

Year:	2000	2001	2002	2003	2004	2005	2006	2007
Wage:	119	133	144	157	175	184	189	194
CPI:	100	107.6	106.6	107.6	116.2	118.9	119.8	120.2

i) Determine the real wage of laborers during 2000-2007 as compared with their wages in 2000.
ii) Also, determine the purchasing power of the rupee for all the years compared to 2000. What would be the economic interpretation of your results?   **[15M]**

Q3: A manufacturing firm produces Bluetooth speakers in two plants (A and B) with daily production volumes of 1,500 and 2,000 units, respectively. The experience reports that the fractions of defective output produced by the two plants are 0.006 and 0.008, respectively. On an inspection day, a speaker is selected from the day's production and found defective. What is the probability that it comes from plants A and B?   **[10M]**

Q4: Based on your knowledge gained in the course on Statistical Inference, answer the following:

a) A simple random sample of size 100 has a mean of 15, with a population variance of 25. Find an interval estimate of the population mean with a confidence level of 99 % and 95 % separately. Also, explain the procedure to calculate the required interval estimates when population variance is not given. **[7M]**

b) The sales data of an item in six shops before and after a unique promotional campaign are as follows. Can the campaign be judged to be a success? Test at a 5 % level of significance with standard error $= \frac{S}{\sqrt{n}}$. The notations have their usual meanings. **[8M]**

Shops:	I	II	III	IV	V	VI
Before:	53	28	31	48	50	42
After:	58	29	30	55	56	45

[Choose correct table values to compare and conclude: $F_{0.05(4,17)} = 3.57$; $t_{0.05(4)} = 2.77$; $t_{0.05(5)} = 2.57$]

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