

**PGDORM**  
**SEMESTER II**  
**ASSIGNMENTS**  
**Academic Year 2020-21**

**Please follow the instructions and submit the assignment in the given time.**

1. Assignment is compulsory.
2. Last date to submit this assignment is 17th July, 2021.
3. Assignment should be in written format. You can write the assignment in the Assignment sheet that you received from the Institute or can use single line A4 size papers.
4. No typed assignments or Xeroxed copies will be accepted.
5. Mention your details on the front page:
  - a) Full Name
  - b) Application ID No. / Seat No.
  - c) Name of the Subject
6. Do not forget to write the page number on each and every page at the top right hand side of the page.
7. Scan and submit the assignment in PDF format on our official MOODLE platform ([eclipse.mu.ac.in](http://eclipse.mu.ac.in)).

# APPLIED STATISTICS

*(20 Marks)*

**NOTE :**

- 1) Attempt all Questions
- 2) Each question carries equal marks

1) a) Calculate Spearman's Rank correlation for the data given

|   |     |     |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| X | 50  | 55  | 65  | 50  | 55  | 60  | 50  | 65  | 70  | 75  |
| Y | 110 | 110 | 115 | 125 | 140 | 115 | 130 | 120 | 115 | 160 |

b) Calculate Karl Pearson's Coefficient of correlation

|   |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|
| X | 100 | 200 | 300 | 400 | 500 | 600 | 700 |
| Y | 30  | 50  | 60  | 80  | 100 | 110 | 130 |

- 2) a) ABC Co. is bringing out a new toy. It is attempting to decide whether to bring out a full, partial or small product line. The company has three levels of demands Good, Fair & Poor with estimated probabilities 0.2, 0.4, 0.4 respectively. The payoff table is as under. Suggest suitable decision 1) using EMV Criterion 2) EOL Criterion.

|      | FULL  | PARTIAL | POOR |
|------|-------|---------|------|
| GOOD | 8000  | 7000    | 5000 |
| FAIR | 5000  | 4500    | 4000 |
| POOR | -2500 | -1000   | 0000 |

b) Given following Payoff matrix suggest best course of action using i) maximax ii) minimin iii) maximin iv) Laplace v) minimax regret.  
State of nature = S1, S2, S3, S4, S5.. Actions = A1, A2, A3, A4

|    | A1  | A2  | A3   | A4  |
|----|-----|-----|------|-----|
| S1 | 100 | 150 | 300  | 150 |
| S2 | -50 | 200 | 200  | 200 |
| S3 | 125 | 50  | -100 | 300 |
| S4 | 140 | 100 | 150  | 100 |
| S5 | 135 | 100 | 0    | 0   |

- 3) a) Ten pieces of cloths out of different rolls of equal length contained following number of defects (1,3,5,0,6,0,9,4,4,3) . Draw a suitable control chart & state whether the process is in a state of control.

b) State whether the new treatment is superior to the old treatment. (LOS 5%)

|     | FAVOURABLE RESULT | UNFAVOURABLE RESULT |
|-----|-------------------|---------------------|
| NEW | 140               | 30                  |
| OLD | 60                | 20                  |

4) A tea company appoints 4 salesmen A, B, C, D & observe their sales in 3 seasons, details are given below

|         | A  | B  | C  | D  |
|---------|----|----|----|----|
| SUMMER  | 36 | 36 | 21 | 35 |
| WINTER  | 28 | 29 | 31 | 32 |
| MONSOON | 26 | 28 | 29 | 29 |

- Do the salesmen significantly differ in performance?
- Is there a significant difference in sales between seasons?

## ADVANCED LINEAR PROGRAMMING

*(20 Marks)*

**NOTE :**

- 1) Attempt all Questions**
- 2) Each question carries equal marks**

| Q.1)            | <p>A firm has divided its marketing areas into three zones. The amount of sales depends upon the number of salesmen in each zone. The firm has been collecting the data regarding sales and salesmen in each area over a number of past years. The information is summarized in Table 1. For the next year firm has only 9 salesmen and the problem is to allocate these salesmen to three different zones so that the total sales are maximum.</p> <p>Table 1 – Profit in Rs. (K)</p> <table style="margin-left: auto; margin-right: auto;"><thead><tr><th>No. of Salesmen</th><th>Zone 1</th><th>Zone 2</th><th>Zone 3</th></tr></thead><tbody><tr><td>0</td><td>30</td><td>35</td><td>42</td></tr><tr><td>1</td><td>45</td><td>45</td><td>54</td></tr><tr><td>2</td><td>60</td><td>52</td><td>60</td></tr><tr><td>3</td><td>70</td><td>64</td><td>70</td></tr><tr><td>4</td><td>79</td><td>72</td><td>82</td></tr><tr><td>5</td><td>90</td><td>82</td><td>95</td></tr><tr><td>6</td><td>98</td><td>93</td><td>102</td></tr><tr><td>7</td><td>105</td><td>98</td><td>110</td></tr><tr><td>8</td><td>100</td><td>100</td><td>110</td></tr><tr><td>9</td><td>99</td><td>100</td><td>110</td></tr></tbody></table> | No. of Salesmen | Zone 1 | Zone 2 | Zone 3 | 0 | 30 | 35 | 42 | 1 | 45 | 45 | 54 | 2 | 60 | 52 | 60 | 3 | 70 | 64 | 70 | 4 | 79 | 72 | 82 | 5 | 90 | 82 | 95 | 6 | 98 | 93 | 102 | 7 | 105 | 98 | 110 | 8 | 100 | 100 | 110 | 9 | 99 | 100 | 110 |
|-----------------|---|-----------------|--------|--------|--------|---|----|----|----|---|----|----|----|---|----|----|----|---|----|----|----|---|----|----|----|---|----|----|----|---|----|----|-----|---|-----|----|-----|---|-----|-----|-----|---|----|-----|-----|
| No. of Salesmen | Zone 1  | Zone 2          | Zone 3 |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 0               | 30  | 35              | 42     |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 1               | 45  | 45              | 54     |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 2               | 60  | 52              | 60     |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 3               | 70  | 64              | 70     |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 4               | 79  | 72              | 82     |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 5               | 90  | 82              | 95     |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 6               | 98  | 93              | 102    |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 7               | 105   | 98              | 110    |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 8               | 100   | 100             | 110    |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| 9               | 99  | 100             | 110    |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| Q.2)            | <p>Maximize <math>Z = x_1 + 4x_2</math><br/>Subject to,<br/><math>2x_1 + 4x_2 \leq 7</math><br/><math>5x_1 + 3x_2 \leq 15</math><br/><math>x_1, x_2</math> are integers <math>\geq 0</math></p>   |                 |        |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| Q.3)            | <p>Discuss : “In Goal programming, we attempt to satisfy or come as close as possible to satisfying various Goals”</p>  |                 |        |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |
| Q.4)            | <p><b>Explain following :</b></p> <ol style="list-style-type: none"><li>a) Characteristics of Dynamic Programming</li><li>b) Branch and Bound method in Integer Programming</li><li>c) Pre-emptive Goal Programming Problem</li><li>d) Different types of Parametric Linear Programming problems</li><li>e) Different types of non-linear Programming</li></ol>   |                 |        |        |        |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |    |   |    |    |     |   |     |    |     |   |     |     |     |   |    |     |     |

## OPTIMIZATION MODELS - 2

*(20 Marks)*

**NOTE :**

- 1) Attempt all Questions**
- 2) Each question carries equal marks**

1. A sales manager has to assign salesman to 4 territories. He has 4 candidates of varying experience and capabilities. The manager assesses the possible profit for each salesman in each territory as given below.

| Salesman | Territory |    |    |    |
|----------|-----------|----|----|----|
|          | T1        | T2 | T3 | T4 |
| S1       | 35        | 27 | 28 | 37 |
| S2       | 28        | 34 | 29 | 40 |
| S3       | 35        | 24 | 32 | 33 |
| S4       | 24        | 32 | 25 | 28 |

Find the assignment of salesman to the territories so that total profit is maximum.

2. A company wants to appoint 4 salesmen in 4 districts. Sale projection in Rs. for each salesman is given in district. How should the company appoint the salesman to achieve maximum total sales

| Salesman | Districts |     |      |     |
|----------|-----------|-----|------|-----|
|          | A         | B   | C    | D   |
| 1        | 420       | 168 | 240  | 70  |
| 2        | 360       | 336 | 1120 | 210 |
| 3        | 420       | 240 | 336  | 84  |
| 4        | 126       | 168 | 224  | 56  |

3. A cement company has three factories which manufacture cement which is then transported to four distribution centres. The quantity of monthly production of each factory, the demand of each distribution centre and the associated cost per quintal are given as follows: Find IFS by (i) NWCM (ii) LCM (iii) VAM (iv) Find transportation cost for each method

| Factories | Distribution |             |             |             | Supply       |
|-----------|--------------|-------------|-------------|-------------|--------------|
|           | W            | X           | Y           | Z           |              |
| A         | 10           | 8           | 5           | 4           | <b>7000</b>  |
| B         | 7            | 9           | 15          | 8           | <b>8000</b>  |
| C         | 6            | 10          | 14          | 8           | <b>10000</b> |
| Demand    | <b>6000</b>  | <b>6000</b> | <b>8000</b> | <b>5000</b> |              |

4. A company has 3 warehouses W1, W2 and W3 from where it supplies product to 3 markets M1, M2 and M3. Availability at warehouses is 2000, 1500 and 1000 units. Market requirements are 1200, 1800 and 1000 units. Profit potential per unit from each warehouses to each market is as follows:

| Market \ Warehouse | M1 | M2 | M3 |
|--------------------|----|----|----|
| W1                 | 25 | 22 | 23 |
| W2                 | 15 | 20 | 18 |
| W3                 | 18 | 17 | 16 |

Find optimal transportation schedule, to **maximize** the total profit.

Find IFS by (i) NWCM (ii) LCM (iii)VAM (iv)Find transportation profit for each method.