

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

CLASS: PRE PHD  
BRANCH: ALL

SEMESTER : I  
SESSION : SP/2023

SUBJECT: MT601 RESEARCH METHODOLOGY

TIME: 3 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- |   |       | CO    | BL   |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
|---|-------|-------|------|-----------|-------|------|------|------|------|-----------------------|-----|-----|-----|-----|----------------------|----|----|----|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|----|----|----|----|----|
| Q.1(a) Define Research Methodology. Discuss the objective of research and what are the process and method of research problem? Give a suitable Example.   | [5]   | 1     | 1    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.1(b) Assume yourself as manager of a research firm, your firm has been hired by an FMCG company, the company is about to launch new toothpaste in market. Develop a research plan to map the response of probable consumer related to same?   | [5]   | 1&2   | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.2(a) Describe the steps involved in the research design process. How would you determine which research design is appropriate for a particular research question?   | [5]   | 3     | 2    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.2(b) Critically examine the role of sampling in research design. What are the different types of sampling techniques commonly used in research?   | [5]   | 2 & 3 | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.3(a) Find correlation coefficient between the sales and expenses from the data given below.   | [5]   | 4 & 5 | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;">Firm</td> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td> </tr> <tr> <td>Sales (Rs. Lakh)</td> <td>50</td><td>50</td><td>55</td><td>60</td><td>65</td><td>65</td><td>65</td><td>60</td><td>60</td><td>50</td> </tr> <tr> <td>Expenses (Rs. Lakh)</td> <td>11</td><td>13</td><td>14</td><td>16</td><td>16</td><td>15</td><td>15</td><td>14</td><td>13</td><td>13</td> </tr> </table>   |       |       |      | Firm      | 1     | 2    | 3    | 4    | 5    | 6                     | 7   | 8   | 9   | 10  | Sales (Rs. Lakh)     | 50 | 50 | 55 | 60 | 65 | 65 | 65 | 60 | 60 | 50 | Expenses (Rs. Lakh)  | 11 | 13 | 14 | 16 | 16 | 15 | 15 | 14 | 13 | 13 |
| Firm  | 1     | 2     | 3    | 4         | 5     | 6    | 7    | 8    | 9    | 10                    |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Sales (Rs. Lakh)  | 50    | 50    | 55   | 60        | 65    | 65   | 65   | 60   | 60   | 50                    |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Expenses (Rs. Lakh)   | 11    | 13    | 14   | 16        | 16    | 15   | 15   | 14   | 13   | 13                    |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.3(b) Apply the method of least square to obtain the trend values from the following Data.   | [5]   | 5     | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;">Year</td> <td>2006</td><td>2007</td><td>2008</td><td>2009</td><td>2010</td> </tr> <tr> <td>Sales (in Lakh tones)</td> <td>100</td><td>120</td><td>110</td><td>140</td><td>80</td> </tr> </table> <p>Use the graph Paper and show the actual sales production and trend value production.</p>  |       |       |      | Year      | 2006  | 2007 | 2008 | 2009 | 2010 | Sales (in Lakh tones) | 100 | 120 | 110 | 140 | 80                   |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Year  | 2006  | 2007  | 2008 | 2009      | 2010  |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Sales (in Lakh tones)   | 100   | 120   | 110  | 140       | 80    |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.4(a) To calculate a Spearman rank-order correlation of the data given below.  | [5]   | 3     | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td></td> <td colspan="10">Marks</td> </tr> <tr> <td>Physics</td> <td>56</td><td>75</td><td>45</td><td>71</td><td>61</td><td>64</td><td>58</td><td>80</td><td>76</td><td>61</td> </tr> <tr> <td>Chemistry</td> <td>66</td><td>70</td><td>40</td><td>60</td><td>65</td><td>56</td><td>59</td><td>77</td><td>67</td><td>63</td> </tr> </table>  |       |       |      |           | Marks |      |      |      |      |                       |     |     |     |     | Physics              | 56 | 75 | 45 | 71 | 61 | 64 | 58 | 80 | 76 | 61 | Chemistry            | 66 | 70 | 40 | 60 | 65 | 56 | 59 | 77 | 67 | 63 |
|   | Marks |       |      |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Physics   | 56    | 75    | 45   | 71        | 61    | 64   | 58   | 80   | 76   | 61                    |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Chemistry   | 66    | 70    | 40   | 60        | 65    | 56   | 59   | 77   | 67   | 63                    |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.4(b) Two Managers are asked to rank a group of employees in order of potential for eventually becoming top managers. The ranking are as follows.  | [5]   | 3 & 4 | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 10%;">Employees</td> <td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td><td>G</td><td>H</td><td>I</td><td>J</td> </tr> <tr> <td>Ranking by Manager A</td> <td>10</td><td>2</td><td>1</td><td>4</td><td>3</td><td>6</td><td>5</td><td>8</td><td>7</td><td>9</td> </tr> <tr> <td>Ranking by Manager B</td> <td>9</td><td>4</td><td>2</td><td>3</td><td>1</td><td>5</td><td>6</td><td>8</td><td>7</td><td>10</td> </tr> </table> <p>Compute the coefficient of Rank correlation and comment on the value.</p> |       |       |      | Employees | A     | B    | C    | D    | E    | F                     | G   | H   | I   | J   | Ranking by Manager A | 10 | 2  | 1  | 4  | 3  | 6  | 5  | 8  | 7  | 9  | Ranking by Manager B | 9  | 4  | 2  | 3  | 1  | 5  | 6  | 8  | 7  | 10 |
| Employees   | A     | B     | C    | D         | E     | F    | G    | H    | I    | J                     |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Ranking by Manager A  | 10    | 2     | 1    | 4         | 3     | 6    | 5    | 8    | 7    | 9                     |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Ranking by Manager B  | 9     | 4     | 2    | 3         | 1     | 5    | 6    | 8    | 7    | 10                    |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.5(a) How is structural equation modeling similar to the other multivariate techniques and how is it different?  | [5]   | 5     | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |
| Q.5(b) Explain the purpose and contents of the introduction section in a research report. What are the key elements that should be included in the introduction?  | [5]   | 5 & 4 | 3    |           |       |      |      |      |      |                       |     |     |     |     |                      |    |    |    |    |    |    |    |    |    |    |                      |    |    |    |    |    |    |    |    |    |    |