**RV-010-001510** Seat No. _____

# B. B. A. (Sem. V) (CBCS) Examination

**March - 2019**

## 510 - Operation Research - I

***(Old Course)***

**Faculty Code : 010**
**Subject Code : 001510**

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

**Instructions :** (1) All questions are compulsory.
(2) Each question carries equal marks.
(3) Use of calculator is permissible.

**1** (a) Describe various types of research. **7**

(b) Discuss scope of Operation Research. **7**

**OR**

**1** What is Research ? Describe briefly the different steps involved in Research process. **14**

**2** (a) What do you mean by non-parametric test ? Explain its characteristics. **7**

(b) Describe briefly U-test. **7**

**OR**

**2** Use Kruskal-Wallis test for testing the null hypothesis that a professional bowler performs equally well with the four bowling balls at 5% level of significance. The following are the results. **14**

| Results in 5 games | | | |
|---|---|---|---|
| A | B | C | D |
| 271 | 252 | 260 | 279 |
| 282 | 275 | 255 | 242 |
| 257 | 302 | 239 | 297 |
| 248 | 268 | 246 | 270 |
| 262 | 276 | 266 | 258 |

3 What is mean by linear programming problem (LPP) ? State the assumptions, advantages and limitations of linear programming. **14**

**OR**

3 Solve the following equations by Graphical method : **14**

Maximize $Z = 30x_1 + 15x_2$

$$x_1 + \frac{3}{2}x_2 \leq 200$$

$$2x_1 + x_2 \leq 200$$

$$3x_1 \leq 200$$

$$x_1, x_2 \geq 0$$

4 What do you mean by Transportation problem (T.P.) ? Describe any two methods for obtaining initial feasible solution. **14**

**OR**

4 Explain MODI method for solving large transportation problem. **14**

5 Explain Hungarian method for solving an Assignment Problem. **14**

**OR**

5 Three jobs $J_1, J_2, J_3$ are to be assigned to three workers among the four available $A, B, C, D$. The estimated costs for each of job-worker combination are given in the table below : **14**

| | Jobs | | |
|---|---|---|---|
| Worker | $J_1$ | $J_2$ | $J_3$ |
| $A$ | 11 | 14 | 6 |
| $B$ | 8 | 10 | 11 |
| $C$ | 9 | 12 | 7 |
| $D$ | 10 | 13 | 8 |

Determine the optimal assignment to minimize the total cost.