# UNIVERSITY OF PETROLEUM & ENERGY STUDIES
## End Semester Examination – MAY 2022

**Program: MBA-ALL**       **Semester: II**
**Subject/Course: Operation Research**      **Max. Marks: 100**
**Course Code: DSQT 7002**      **Duration: 3 Hours**

| Q.No | Section A(multiple choice question) | Marks | COs |
|---|---|---|---|
| Q1. | i) Which of the following is a type of inventory system that is used to manage independent demand items?<br>    A. Order point system<br>    B. Material Requirements Planning<br>    C. Time Phased Order Point<br>    D. Enterprise Resource Planning<br><br>ii) Effective inventory management minimizes the investment in inventory by effectively meeting the ___.<br>    A. Functional requirement<br>    B. Customer requirement<br>    C. Process reliability<br>    D. Sales forecasting of a firm<br><br>iii) Which of the following models is used to calculate the timing of the inventory order?<br>    A. Economic order quantity model<br>    B. Fixed order quantity model<br>    C. Reorder point model<br>    D. Fixed order inventory model<br><br>iv)Graphic method can be applied to solve a LPP when there are only ------------- variable<br>    a) One<br>    b) More than One<br>    c) Two<br>    d) Three | 2* 10=20 | CO1 |

| | | | |
|---|---|---|---|
| | v)The operations Research technique, specially used to determine the optimum strategy is<br>     a) Decision Theory<br>    b) Simulation<br>   c) Game Theory<br>    d) None of the above<br>vi)The objective functions and constraints are linear relationship between ------------<br>    a) Variables<br>     b) Constraints<br>    c) Functions<br>    d) All of the above<br>vii)A minimization problem can be converted into a maximization problem by changing the sign of coefficients in the -------------------<br>    a) Constraints<br>    b) Objective Functions<br>   c ) Both A and B<br>    d) None of the above<br>viii) In simplex method , we add ---------------- variables in the case of '='<br>    a) Slack Variable<br>    b) Surplus Variable<br>    c) Artificial Variable<br>    d) None of the above<br>ix) In simplex algorithm, which method is used to deal with the situation where an infeasible starting basic solution is given?<br>    a) Slack variable<br>     b) Simplex method<br>     c) M- method<br>    d) None of the above<br>x) What do we apply in order to determine the optimum solution?<br>    a) LPP<br>    b) VAM<br>    c) MODI Method<br>    d) None of the above | | |
| | **Section B** | | |
| Q2. | i)Solve by simplex method : given LPP is Max Z= 30x+ 40y+20z<br><br>Subject to<br><br>$10x+12y+7z \leq 10000$<br><br>$7x+10y+8z \leq 8000$<br><br>$x+y+z \leq 1000$<br><br>$x,y,z \geq 0$ | 5*4=20 | CO2 |

ii) A firm is considering replacement of a machine, whose cost price is Rs 12200 and the scrap value Rs 200. The running (maintenance and operating cost) in Rs are found from experience to be as follows.

| year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------|---|---|---|---|---|---|---|---|
| Running cost | 200 | 500 | 800 | 1200 | 1800 | 2500 | 3200 | 4000 |

iii) A steel company estimates its carrying cost at 15% and its ordering cost Rs 9 per order. The estimated annual requirement is 48000 units at a price of Rs 4 per unit. Calculate

a) EOQ

b) How many orders should place in a year?

c) How often should an order be place?

iv) Find out the minimum cost solution for the following transportation problem, using North West Corner Rule method.

|  | P | Q | R | SUPPLY |
|--|---|---|---|--------|
| A | 16 | 19 | 12 | 14 |
| B | 22 | 13 | 19 | 16 |
| C | 14 | 28 | 8 | 12 |
| DEMAND | 10 | 15 | 17 | |

## Section C

i) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule.

Job

|          |   | 1 | 2 | 3 | 4 | 5 |
|----------|---|---|---|---|---|---|
|          | A | 8 | 4 | 2 | 6 | 1 |
| Person   | B | 0 | 9 | 5 | 5 | 4 |
|          | C | 3 | 8 | 9 | 2 | 6 |
|          | D | 4 | 3 | 1 | 0 | 3 |
|          | E | 9 | 5 | 8 | 9 | 5 |

ii) Find the basic feasible solution for the following transportation problem by vogel's approximation method.

|        | P   | Q   | R   | S   | SUPPLY |
|--------|-----|-----|-----|-----|--------|
| A      | 11  | 13  | 17  | 14  | 250    |
| B      | 16  | 18  | 14  | 10  | 300    |
| C      | 21  | 24  | 13  | 10  | 400    |
| DEMAND | 200 | 225 | 275 | 250 |        |

iii) Find the optimum cost of transportation from MODI's method.

|        | P  | Q  | R  | SUPPLY |
|--------|----|----|----|--------|
| A      | 6  | 4  | 1  | 50     |
| B      | 3  | 8  | 7  | 40     |
| C      | 4  | 4  | 2  | 60     |
| DEMAND | 20 | 95 | 35 | 150    |

Q3.

10*3=30    CO3

## Section D

i) Solve 2xn game theory problem by graphical method

|     | B1 | B2 | B3 | B4 |
|-----|-----|-----|-----|-----|
| A1  | 1   | 3   | 12  | 13  |
| A2  | 8   | 6   | 2   | 9   |

Q4.

ii)Use penalty (or Big M ) method to

Minimize $z=4x_1 + 3x_2$

$2x_1 + x_2 \geq 10, \quad -3x_1 + 2x_2 \leq 6, \quad x_1 + x_2 \geq 6,$

$$x_1, x_2 \geq 0$$

15*2=30    CO4