Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**PDDC - SEMESTER–VII EXAMINATION – SUMMER 2016**

**Subject Code:X71903** **Date:05/05/2016**

**Subject Name:02:30 PM to 05:00 PM**

**Time:02:30 PM to 05:00 PM** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **(a)** What are the essential characteristics of operation research? Explain different phases in an operation research study. **07**

**(b)** Maximize $Z=5X_1+10X_2+8X_3$ **07**

Subject to $3X_1+5X_2+2X_3 \leq 60$

$4X_1+4X_2+4X_3 \leq 72$

$2X_1+4X_2+5X_3 \leq 100$

$X_1,X_2,X_3 \geq 0$

Solve above Linear Programming Problem by Simplex Method.

**Q.2** **(a)** Consider the transportation problem as shown in following table **07**

| From \ To | | Warehouse 1 | 2 | 3 | 4 | Supply |
|---|---|---|---|---|---|---|
| Plant | A | 20 | 4 | 32 | 28 | 300 |
| | B | 12 | 36 | 24 | 26 | 500 |
| | C | 16 | 8 | 28 | 24 | 825 |
| | D | 28 | 44 | 40 | 16 | 375 |
| Demand | | 350 | 400 | 250 | 150 | |

Find the initial feasible solution using (i) North-West Corner method and (ii) Least Cost Method and compare their cost. Which method gives least cost?

**(b)** Solve the following by VAM and test its optimality by MODI method. The shipping costs from Plant to Market are given: **07**

| From \ To | | Market M1 | M2 | M3 | Plant capacity |
|---|---|---|---|---|---|
| Plant | P1 | 6 | 4 | 1 | 50 |
| | P2 | 3 | 8 | 7 | 40 |
| | P3 | 4 | 4 | 2 | 60 |
| Project Requirement | | 20 | 95 | 35 | 150 |

**OR**

**(b)** Solve the following by NWC and test its optimality by stepping stone method. The shipping costs are given: **07**

| From \ To | Project A | B | C | Plant capacity |
|---|---|---|---|---|
| W | 4 | 8 | 8 | 56 |
| X | 16 | 24 | 16 | 82 |
| Y | 8 | 16 | 24 | 77 |
| Project Requirement | 72 | 102 | 41 | 215 |

**Q.3** **(a)** The captain of cricket team has to allot five middle batting positions to five batsmen. The average runs scored by each batsman at these positions are as follows: **07**

| | | Batting Positions | | | | |
|---|---|---|---|---|---|---|
| | | I | II | III | IV | V |
| Batsman | P | 40 | 40 | 35 | 25 | 50 |
| | Q | 42 | 30 | 16 | 25 | 27 |
| | R | 50 | 48 | 40 | 60 | 50 |
| | S | 20 | 19 | 20 | 18 | 25 |
| | T | 58 | 60 | 59 | 55 | 53 |

Find the assignment of batsman to positions, which would give maximum number of runs.

**(b)** Solve the following problem by using the principle of dominance: **07**

| | | Player B | | | | | |
|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI |
| Player A | I | 4 | 2 | 0 | 2 | 1 | 1 |
| | II | 4 | 3 | 1 | 3 | 2 | 2 |
| | III | 4 | 3 | 7 | -5 | 1 | 2 |
| | IV | 4 | 3 | 4 | -1 | 2 | 2 |
| | V | 4 | 3 | 3 | -2 | 2 | 2 |

**OR**

**Q.3** **(a)** Consider a problem of assigning four clerks to four tasks. The time required is given below. **07**

| Tasks | | A | B | C | D |
|---|---|---|---|---|---|
| Clerks | 1 | 4 | 7 | 5 | 6 |
| | 2 | - | 8 | 7 | 4 |
| | 3 | 3 | - | 5 | 3 |
| | 4 | 6 | 6 | 4 | 3 |

Clerk 2 cannot assigned to task A and clerk 3 cannot assign to task B. Find all the optimum assigned schedules.

**(b)** In a game, player A has three choices X, Y and Z and player B has two choices P and Q. Payment have been agreed to be made as per arrangement shown in below solve the game. **07**

| | | Player B | |
|---|---|---|---|
| | | P | Q |
| Player A | X | -5 | 5 |
| | Y | -6 | 4 |
| | Z | 8 | 4 |

**Q.4** **(a)** With Respect to the queue system, explain the following term: **07**

(i) Input process
(ii) Queue discipline
(iii) Capacity of the system
(iv) Holding time
(v) Balking
(vi) Jockeying
(vii) Reneging

**(b)** A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one-month usage at a time. Each part costs Rs. 20. The ordering cost per order is Rs. 15 and carrying charges are 15% of the inventory per year. Suggest a more economical purchasing policy for the company. What advice would you offer and how would it save the company per year? **07**

**OR**

**Q.4** **(a)** With Respect to the Inventory Management explain the following term: **07**

(i) EOQ
(ii) Lead time
(iii) Reorder Level
(iv) Holding cost
(v) Stock out cost
(vi) Setup cost
(vii) Ordering cost

**(b)** Maintenance of machine can be carried out in 5 operations which have to be performed in a sequence. Time taken for each of these operations has a mean time of 5 minutes and follows exponential distribution. The breakdown of machine follows Poisson distribution and average rate of breakdown is 3 per hour. Assume that there is only one mechanic available, find out the average idle time for each machine breakdown. **07**

**Q.5** **(a)** Explain the Monte Carlo method of simulation with suitable example. **07**

**(b)** The details of activities and project duration are given below: **07**

| Activity | Immediate Predecessor | Duration (Weeks) |
|---|---|---|
| A | - | 2 |
| B | - | 3 |
| C | - | 3 |
| D | A | 5 |
| E | B | 5 |
| F | B | 9 |
| G | C | 3 |
| H | D | 3 |
| I | E | 5 |
| J | F,G | 6 |
| K | H,I | 4 |

Determine:

(a) Critical path and total project duration
(b) Earliest and latest event time (EST and LST)

**OR**

**Q.5** **(a)** What is Dynamic Programming? What are the advantages, disadvantages and applications of dynamic programming? **07**

**(b)** A truck owner finds from his past records that the maintenance cost of a truck (whose purchase price is Rs. 300000) during the first 8 years of its life and the resale price at the end of each year is as follows: **07**

| Year | Maintenance cost (Rs.) | Resale Price (Rs.) |
|---|---|---|
| 1 | 36000 | 200000 |
| 2 | 48000 | 150000 |
| 3 | 60000 | 100000 |
| 4 | 72000 | 80000 |
| 5 | 84000 | 70000 |
| 6 | 96000 | 60000 |
| 7 | 108000 | 50000 |
| 8 | 120000 | 40000 |

When should the truck be replaced?

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