

**B.TECH. SEM -VII PRODUCTION 2014 COURSE (CBCS) :
WINTER - 2017**

SUBJECT: OPERATIONS RESEARCH

Day: **Friday**
Date: **12/01/2018**

W-2017-2318

Time: **02.30 PM TO 05.30 PM**
Max Marks: **60**

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.
- 4) Use of non programmable **CALCULATOR** is allowed.

Q.1 a) What is OR? Discuss various phases of Operation Research. **(04)**

b) Solve the following LPP by graphical method, **(06)**

Maximize $Z = x_1 + 2x_2$,

subject to the constraints :

$$x_1 + x_2 \leq 6$$

$$x_1 + x_2 \leq 2$$

$$x_1 + 3x_2 \geq 6$$

$$-x_1 + 3x_2 \leq 10$$

$$x_1, x_2 \geq 0$$

OR

Solve the following problem by simplex method : **(10)**

Maximize $Z = 3x_1 + 2x_2$,

subject to the constraints :

$$2x_1 + x_2 \leq 40$$

$$x_1 + x_2 \leq 24$$

$$2x_1 + 3x_2 \leq 60$$

$$x_1, x_2 \geq 0$$

Q.2 a) Explain the method to solve a maximization type of assignment problem. **(03)**

b) Determine an initial basic feasible solution using Row minima method **(07)**

| | | Destination | | | | Supply |
|--------|---|-------------|----|----|----|--------|
| | | 1 | 2 | 3 | 4 | |
| Source | 1 | 21 | 16 | 15 | 13 | 11 |
| | 2 | 17 | 18 | 14 | 23 | 13 |
| | 3 | 32 | 27 | 18 | 41 | 19 |
| Demand | | 6 | 10 | 12 | 15 | 43 |

OR

P.T.O.

Find initial solution by VAM and revise once for optimum solution (10)

| | | | | | |
|--------|---|----|---|----|--------|
| | | To | | | Supply |
| | | 1 | 2 | 3 | |
| From | 1 | 2 | 7 | 4 | 5 |
| | 2 | 3 | 3 | 7 | 8 |
| | 3 | 5 | 4 | 1 | 7 |
| | 4 | 1 | 6 | 2 | 14 |
| Demand | | 7 | 9 | 18 | |

Q.3 a) What is selective inventory control? State various methods of selective inventory control and explain any one. (05)

b) The cost of parameters and other factors for a production inventory system of automobile pistons are given below. Find : (05)

i) optimal lot size,

ii) manufacturing time and time between set ups

Demand per year = 6000 units

Units cost = Rs 40

Set up cost = Rs 500

Production rate per year = 36,00 units

Holding cost per year = Rs. 8

Shortage cost per unit per year = Rs.20

OR

a) Derive an equation for EOQ, with constant rate of demand, scheduling time constant and shortages allowed. (05)

b) Find the optimum order quantity for a product for which price breaks are as follows : (05)

Quantity (units)

Price per Unit (Rs.)

$0 < Q_1 < 500$

10.00

$500 \leq Q_2$

9.00

The monthly demand for the product is 200 units, the cost of storage is 2% of the unit cost and the cost of ordering is Rs.350.

Q.4 a) Explain the procedure for processing of n jobs on two machines. (04)

b) A tailor specializes in ladies dresses. The number of customers approaching the tailor appear to be Poisson distributed with a mean of 6 customers per hour. The tailor attends the customers on a first-come-first-served basis and the customers wait if the need be. The tailor can attend the customers at an average rate of 10 customers / hour with the service time exponentially distributed. (06)

1) Find the probability of number of arrivals (0 through 5) during 15 minutes interval

2) The utilization parameter

3) The probability that the queuing system is idle.

OR

a) Describe various notations used in any of the queuing model. Also explain the performance measures of the queuing model. (04)

b) We have, 5 jobs , each of which must be processed on two machines A & B in order AB processing time to Hrs are given in the table below : (06)

| | | | | | |
|---------------|---|---|---|---|----|
| Job | 1 | 2 | 3 | 4 | 5 |
| Machine M_1 | 5 | 1 | 9 | 3 | 10 |
| Machine M_2 | 2 | 6 | 7 | 8 | 4 |

Determine a sequence for the five jobs that will min the elapsed time T.

Q.5 a) Explain in detail the Minimax and Maximin Principle of game theory. **(03)**

b) An electromechanical equipment has a purchase price of Rs.7000. its running cost per year and resale values are given below : **(07)**

| | | | | | | | | |
|--------------------|------|------|------|------|------|------|------|------|
| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Running cost (Rs.) | 2000 | 2100 | 2300 | 2600 | 3000 | 3500 | 4100 | 4600 |
| Resale value | 4000 | 3000 | 2200 | 1600 | 1400 | 700 | 700 | 700 |

At which year is the replacement due?

OR

a) Solve the following two person zero sum game. **(05)**

| | | |
|----------------|----------------|----------------|
| | Player B | |
| Player A | B ₁ | B ₂ |
| A ₁ | 1 | 2 |
| A ₂ | 4 | -3 |

b) Discuss the replacement policy for the items that fail suddenly. **(05)**

Q.6 A research and development department is developing a new power supply for a console television set. It has broken the job down into the following : **(10)**

| Job | Immediate Predecessors | Time (Days) |
|-----|------------------------|-------------|
| A | - | 5 |
| B | A | 7 |
| C | B | 2 |
| D | B | 3 |
| E | C | 1 |
| F | D | 2 |
| G | C | 1 |
| H | E, F | 3 |
| I | G, H | 10 |

- Draw the network and find out the critical path and project duration.
- Calculate EST, EFT, LST, LFT.
- Calculate total float, independent float and free float.

OR

The following table gives data on normal time and cost, and crash time and cost for a project : **(10)**

| Activity | Duration (Weeks) | | Total Cost (Rs.) | |
|----------|------------------|-------|------------------|-------|
| | Normal | Crash | Normal | Crash |
| 1-2 | 3 | 2 | 300 | 450 |
| 2-3 | 3 | 3 | 75 | 75 |
| 2-4 | 5 | 3 | 200 | 300 |
| 2-5 | 4 | 4 | 120 | 120 |
| 3-4 | 4 | 1 | 100 | 190 |
| 4-6 | 3 | 2 | 90 | 130 |
| 5-6 | 3 | 1 | 60 | 110 |

- Draw the network and find out the critical path and the normal project duration.
- Find out the total float associated with each activity.
- If the indirect costs are Rs.100 per week, find out the optimum duration by crashing and the corresponding project costs.