(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 140851            Roll No.☐☐☐☐☐☐☐☐☐☐

## B. TECH.

## Theory Examination (Semester-VIII) 2015-16

## OPERATIONS RESEARCH

*Time : 3 Hours*                          *Max. Marks : 100*

### Section-A

1. Attempt all parts. All parts carry equal marks. Write
   answer of each part in short.                    (2×10=20)

   (a)   Discuss simplex and convex set with respect to LPP.

   (b)   Explain the concept of alternate optima in LPP.

   (c)   What is degeneracy in TP?

   (d)   What is curse of dimensionality?

   (e)   Why we use dominance property?

   (f)   How can we solve problems with risk?

   (g)   What are different techniques of selective inventory
         control?

   (h)   When we need simulation?

(i)  Explain balking in queue.

(j)  What do you understand by crashing of resources?

## Section-B

2.  **Attempt any five questions from this section.**

(10×5=50)

(a)  Solve the given LPP model by simplex method:

Max $Z = 3x_1 + 2x_2$

Subject to,

$2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0$

(b)  Obtain optimal solution of the transportation problem given below :

|       | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|-------|-------|-------|-------|-------|--------|
| $F_1$ | 2     | 2     | 2     | 1     | 3      |
| $F_2$ | 10    | 8     | 5     | 4     | 7      |
| $F_3$ | 7     | 6     | 6     | 8     | 5      |
| Demand| 4     | 3     | 4     | 4     |        |

(c)  With help of an example, explain the Hungarian algorithm.

(2)

(d)  Solve the game given below for the two players A and B:

| Player A | Player B | | |
|----------|---|---|----|
|          | 1 | 3 | 11 |
|          | 8 | 5 | 2  |

(e)  A company has six jobs. each of which has to pass through two machines $M_1$ and $M_2$ for processing. The processing time for the jobs on each machine (in hours) is given below:

| Job   | A | B | C | D | E | F |
|-------|---|---|---|---|---|---|
| $M_1$ | 1 | 4 | 6 | 3 | 5 | 2 |
| $M_2$ | 3 | 6 | 8 | 8 | 1 | 5 |

Find optimum sequence, total elapsed time as well as idle times for the two machines.

(f)  A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that when he starts production run, he can produce 25,000 bearings per day. The holding cost of a bearing in stock in Rs 0.02 per year. Set-up cost of a production is Rs 18. How frequently should the production run be made?

(g)  A car par contains 5 cars. The arrival of cars is Poisson with mean of 10 per hour. The length of

(3)                                                    P.T.O.

time each car spends in the car park is exponential with mean of 0.5 hour. How many cars are in the car park on an average?

(h) Consider the following project :

| Activity | Player B | | | Predecessor |
|---|---|---|---|---|
| | $t_0$ | $t_m$ | $t_p$ | |
| A | 3 | 6 | 9 | None |
| B | 2 | 5 | 8 | None |
| C | 2 | 4 | 6 | A |
| D | 2 | 3 | 10 | B |
| E | 1 | 3 | 11 | B |
| F | 4 | 6 | 8 | C,D |
| G | 1 | 5 | 15 | E |

Draw the network and find the critical path and variances. Also find the probability of completing the project by 18 weeks.

## Section-C

**Note : Attempt any two questions from this section.**

**(15×2=30)**

3. (a) Make dual of the following primal model :

Min $Z = 4x_1 + 5x_2 - 3x_3$

Subject to,

$x_1 + x_2 + x_3 = 22$

$3x_1 + 5x_2 - 2x_3 \leq 65$

$x_1 + 7x_2 - 4x_3 \geq 120$

x1, x2 $\geq$ 0 and $x_1$ is unrestricted. (5)

(b) A soft drink distributor takes the contract for the sale of soft drinks at a cricket stadium during a one day match. He has 5 sales boys to assign to three areas of the stadium. The table below, shows estimated sales that can be made with different assignments:

| No of salesmen assigned | East stand | North stand | Club stand |
|---|---|---|---|
| 1 | 15 | 45 | 30 |
| 2 | 30 | 90 | 60 |
| 3 | 60 | 135 | 90 |
| 4 | 120 | 180 | 120 |
| 5 | 150 | 180 | 150 |

Use dynamic programming to obtain assignment of salesmen for sales maximization. (10)

4. (a) Explain the procedure for sequencing 2 jobs on k machines. (5)

(b) Use dual simplex method to solve the LPP model given below : (10)

Max $Z = 3x_1 - x_2$

Subject to, $X_1 + X_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1, x_2 \geq 0$

5. (a) What do you understand by simulation? Discuss different methods for generation of rando numbers.

(5)

(b) The demand for a certain product has a rectangular distribution between 4000 and 5000. Find the optimal order quantity, if the storage cost is Rs 1 per unit and shortage cost is Rs 7 per unit. (10)