# NEW

# 2018

## BCA

### 4th Semester Examination

### OPERATIONS RESEARCH

### PAPER—2203

*Full Marks* : 100

*Time* : 3 Hours

*The figures in the right-hand margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

Answer any *seven* questions :        7×10

1. (a) Define Convex set with an example.        3

   (b) Solve the following LPP by Graphical method :

   Maximize    $Z = 3x_1 + 5x_2$

   Subject to,  $x_1 + 2x_2 \leq 2000$

   $x_1 + x_2 \leq 1500$

   $x_2 \leq 600$

   $x_1, x_2 \geq 0.$        7

2. (a) Define following terms :

Surplus and Artificial variables      2

(b) Solve the following LPP by Simplex method.

Maximize     $z = 4x_1 + 7x_2$

Subject to,    $2x_1 + x_2 \leq 1000$

$$x_1 + x_2 \leq 600$$

$$x_1 + 2x_2 \leq 1000$$

$$x_1, x_2 \geq 0.$$     8

3. (a) Solve the following LPP by

Big–M method :

Maximize   $Z = 2x_1 + 3x_2$

Subject to,    $x_1 + x_2 \leq 8$

$$x_1 + 2x_2 = 5$$

$$2x_1 + x_2 \leq 8$$

$$x_1, x_2 \geq 0.$$     10

4. Give the dual of the following linear programming problem and hence solve it :

C/18/BCA/4th Sem/2203          *(Continued)*

Maximize $z = 3x_1 - 2x_2$

s. to, $x_1 \leq 4$

$x_2 \leq 6$

$x_1 + x_2 \leq 5$

$-x_2 \leq -1$

$x_1, x_2 \geq 0.$     10

5. Use two phase method to solve the following problem :

Maximize $z = 3x_1 - 2x_2$

s. to, $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 2$

$x_1 \leq 4$

$x_1, x_2 \geq 0.$

6. Solve the following transportation problem.

Using VAM.

|  | $D_1$ | $D_2$ | $D_3$ | $D_4$ | ai |
|---|---|---|---|---|---|
| $O_1$ | 1 | 2 | 1 | 4 | 30 |
| $O_2$ | 3 | 3 | 2 | 1 | 50 |
| $O_3$ | 4 | 2 | 5 | 9 | 20 |
| bi | 20 | 40 | 30 | 10 | |

     *(Turn Over)*

7. The Head of the department has five jobs A, B, C, D, E and five sub-ordinates V, W, X, Y, Z. The number of hours each man would take to perform each job is as follows : How would the jobs be allocated to minimize the total time ?     **10**

|   | V | W | X | Y | Z |
|---|---|---|---|---|---|
| A | 3 | 5 | 10 | 15 | 8 |
| B | 4 | 7 | 15 | 18 | 8 |
| C | 8 | 12 | 20 | 20 | 12 |
| D | 5 | 5 | 8 | 10 | 6 |
| E | 10 | 10 | 15 | 25 | 10 |

8. (a) Define event and activity of a project network.

   Write down application of PERT/CPM in a project network techniques.     **3+2**

   (b) Construct a network for each of the projects whose activities and their procedure relationship are given below :     **5**

| Activity | A | B | C | D | E | F | G | H | I | J | K |
|----------|---|---|---|---|---|---|---|---|---|---|---|
| Predecessor | – | – | – | A | B | B | C | D | E | H,I | F,G |

**9.** A small project is Composed on seven activities, whose time estimates are listed in the teable as follows :

| Activity | Estimated Duration (weeks) | | |
|---|---|---|---|
| | Optimistic | Most likely | pessimistic |
| 1–2 | 1 | 1 | 7 |
| 1–3 | 1 | 4 | 7 |
| 1–4 | 2 | 2 | 8 |
| 2–5 | 1 | 1 | 1 |
| 3–5 | 2 | 5 | 14 |
| 4–6 | 2 | 5 | 8 |
| 5–6 | 3 | 6 | 15 |

You are required to :

(i) Draw the project network.

(ii) Find the expected duration and variance of each activity.

(iii) Calculate the earliest and latest occurrence for each event and expected project length. 10

10. Find the sequence that minimizes the total elapsed time (in hours) required to complete the following tasks on two machines.

| Task | A | B | C | D | E | F | G | H | I |
|------|---|---|---|---|---|---|---|---|----|
| M – I | 2 | 5 | 4 | 9 | 6 | 8 | 7 | 5 | 4 |
| M – II | 6 | 8 | 7 | 4 | 3 | 9 | 3 | 8 | 11 |

10

**[Internal Assessment — 30 Marks]**

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