

2 0 1 8

( 6th Semester )

**BACHELOR OF COMPUTER APPLICATIONS**

Paper No. : BCA-602 (iii) (OC)

**( Operation Research )**

( Old Course )

Full Marks : 75

Time : 3 hours

**( PART : A—OBJECTIVE )**

( Marks : 25 )

*The figures in the margin indicate full marks for the questions*

SECTION—A

( Marks : 15 )

1. Tick (✓) the correct answer in the brackets provided : 1×10=10

(a) Who coined the term 'operations research'?

(i) J. F. McCloskey ( )

(ii) F. N. Trefethen ( )

(iii) Both (i) and (ii) ( )

(iv) P. F. Adams ( )

(b) Operations Research (OR), which is a very powerful tool for

(i) research ( )

(ii) decision making ( )

(iii) operations ( )

(iv) All of the above ( )

- (c) OR cannot give perfect \_\_\_\_\_ to a problem.
- (i) answer ( )
  - (ii) decision ( )
  - (iii) solution ( )
  - (iv) Both (i) and (iii) ( )
- (d) Which technique is used in finding a solution for optimizing a given objective under some constraints?
- (i) Linear programming ( )
  - (ii) Queuing theory ( )
  - (iii) Waiting line ( )
  - (iv) All of the above ( )
- (e) Which theory concerns making sound decisions under the conditions of certainty, risk and uncertainty?
- (i) Game theory ( )
  - (ii) Queuing theory ( )
  - (iii) Network analysis ( )
  - (iv) All of the above ( )
- (f) Which technique is used to imitate an operation prior to actual performance?
- (i) Simulation ( )
  - (ii) Decision theory ( )
  - (iii) Game theory ( )
  - (iv) Inventory control ( )
- (g) In \_\_\_\_\_ model, there is risk and uncertainty.
- (i) deterministic ( )
  - (ii) probabilistic ( )
  - (iii) Both (i) and (ii) ( )
  - (iv) All of the above ( )
- (h) For solving an assignment problem, which method is used?
- (i) Hungarian ( )
  - (ii) American ( )
  - (iii) Both (i) and (ii) ( )
  - (iv) All of the above ( )

- (i) If demand is lesser than supply, then dummy demand node is added to make it a
- (i) simple problem ( )
  - (ii) balanced problem ( )
  - (iii) transportation problem ( )
  - (iv) All of the above ( )
- (j) One can find the initial basic feasible solution by using
- (i) VAM ( )
  - (ii) MODI ( )
  - (iii) optimality test ( )
  - (iv) All of the above ( )

**2.** State whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided : 1×5=5

- (a) Dual of the dual is a primal. ( T / F )
- (b) Slack variables are added in the LHS of the constraint to convert the inequality ‘ ’ into an equation. ( T / F )
- (c) VAM stands for Vogel’s approximation method. ( T / F )
- (d) In simplex method, we add artificial variables when no initial basic feasible solution exists. ( T / F )
- (e) If the feasible region of an LPP is empty, the solution is feasible. ( T / F )

### SECTION—B

( Marks : 10 )

Answer the following questions : 2×5=10

1. Define optimality and feasibility condition.
2. What are slack and surplus variables?
3. What is the way to balance a transportation model?
4. Define linear programming.
5. Define critical path.

**( PART : B—DESCRIPTIVE )**

( Marks : 50 )

*The figures in the margin indicate full marks for the questions*

1. (a) Explain the scope of OR in modern management. 5

(b) Explain the phases of implementing OR. 5

**OR**

(c) Explain OR techniques. 5

(d) Write the applications of OR. 5

2. (a) Explain the major characteristics of linear programming problem. 2

(b) Solve the following by graphical method : 8

Maximize  $Z = 5x_1 + 4x_2$

subject to

$$6x_1 + 4x_2 = 24$$

$$x_1 + 2x_2 = 6$$

$$x_1 + x_2 = 1$$

$$x_2 = 2$$

$$x_1, x_2 \geq 0$$

**OR**

(c) Solve the following by simplex method : 10

Maximize  $Z = 16x_1 + 15x_2$

subject to

$$40x_1 + 31x_2 = 124$$

$$x_1 + x_2 = 1$$

$$x_1 = 3$$

$$x_1, x_2 \geq 0$$

3. (a) Solve the following assignment model : 5

	<i>Jack</i>	<i>Jill</i>	<i>Johnny</i>
<i>Washing</i>	15	10	9
<i>Cleaning</i>	9	15	10
<i>Painting</i>	10	12	8

(b) Explain the steps involve in critical path problem. 5

**OR**

(c) Solve the following transportation problem : 10

					<i>Supply</i>
	10	2	20	11	15
	12	7	9	20	25
	4	14	16	18	10
<i>Demand</i>	5	15	15	15	

4. (a) Solve the following by dual simplex method : 10

$$\text{Maximize } Z \quad 3x_1 \quad 2x_2 \quad x_3$$

subject to

$$3x_1 \quad x_2 \quad x_3 \quad 3$$

$$3x_1 \quad 3x_2 \quad x_3 \quad 6$$

$$x_1 \quad x_2 \quad x_3 \quad 3$$

$$x_1, x_2, x_3 \quad 0$$

**OR**

(b) Describe the similarities and differences of CPM and PERT constructions of network. 5

(c) Write the dual for the following primal : 5

$$\text{Maximize } Z \quad 5x_1 \quad 12x_2 \quad 4x_3$$

subject to

$$x_1 \quad 2x_2 \quad x_3 \quad 10$$

$$2x_1 \quad x_2 \quad 3x_3 \quad 8$$

$$x_1, x_2, x_3 \quad 0$$

5. (a) Find the initial basic feasible solution to the following transportation problem by (i) minimum cost method and (ii) North-West corner rule : 10

	$B_1$	$B_2$	$B_3$	<i>Supply</i>
$A_1$	0	2	1	6
$A_2$	2	1	5	9
$A_3$	2	4	3	5
<i>Demand</i>	5	5	10	

**OR**

- (b) Write the advantages and disadvantages of simulation. 5
- (c) Explain about sensitivity analysis. 5

\*\*\*