

Exam. Code : 105404  
Subject Code : 1404

Bachelor in Business Administration 4<sup>th</sup> Semester  
(Batch 2020-23)

**BBA-406 : OPERATIONS RESEARCH**

Time Allowed—3 Hours] [Maximum Marks—50

**Note** :— Attempt *five* questions in all, selecting at least *one* question from each section. The *fifth* question may be attempted from any section. All questions carry equal marks.

**SECTION—A**

1. Discuss and describe the role of linear programming in managerial decision-making bringing out limitations, if any.

2. Solve the following L.P.P. through Simplex method :

$$\text{Maximize } Z = 10x_1 + 20x_2$$

$$\text{Subject to } 2x_1 + 4x_2 \geq 16$$

$$x_1 + 5x_2 \geq 15$$

$$x_1, x_2 \geq 0$$

**SECTION—B**

3. (a) Differentiate Primal and Dual.  
(b) Write the dual of the following linear programming problem :

$$\text{Maximise } Z = 3x_1 + 4x_2 + 7x_3$$

$$\text{Subject to } x_1 + x_2 + x_3 \leq 10$$

$$4x_1 - x_2 - x_3 \geq 15$$

$$x_1 + x_2 + x_3 = 7$$

$$x_1, x_2 \geq 0, x_3 \text{ unrestricted}$$

4. Solve the following transportation problem for optimality :

From	To				Availability
	1	2	3	4	
1	8	8	5	12	7
2	6	9	11	9	7
3	10	15	6	13	10
4	6	8	7	8	6
5	11	10	11	13	5
6	8	14	5	12	6
Demand	9	10	8	14	

SECTION—C

5. Discuss the assumptions underlying the basic EOQ formula. Also, state the economic order quantity model.
6. For the following 'two-person, zero-sum' game, find the optimal strategies for the two players and value of the game :

	Player B			
	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	
Player A	A <sub>1</sub>	5	9	3
	A <sub>2</sub>	6	-12	-11
	A <sub>3</sub>	8	16	10

If the saddle point exists, determine it using the principle of dominance.

### SECTION—D

7. What are the three time estimates used in the context of PERT ? How are the expected duration of a project and its standard deviation calculated ?
8. A project has the following characteristics :

Activity	Preceding Activity	Expected Completion Time (in weeks)
A	None	5
B	A	2
C	A	6
D	B	12
E	D	10
F	D	9
G	D	5
H	B	9
I	C,E	1
J	G	2
K	F,I,J	3
L	K	9
M	H,G	7
N	M	8

- (i) Draw a PERT network for this project.
- (ii) Find the critical path and the project completion time.
- (iii) Prepare an activity schedule showing the ES, EF, LS, LF and slack for each activity.