

AF-128

April-2023

B.Sc., Sem.-VI

CC-311 : Statistics

(Operation Research – II)

Time : 2½ Hours]

[Max. Marks : 70

1. (A) Explain the procedure of converting any primal LPP into its Dual. **9**
 (B) (1) Write the dual of the following LP problem : **9**

$$\text{Max } Z = 3x_1 + 2x_2 + 4x_3$$

$$\text{Subject to constraints } 2x_1 + 5x_2 \leq 9$$

$$5x_1 + 4x_2 \leq 8$$

$$2x_1 + 3x_2 + 7x_3 \leq 6$$

$$x_1, x_2, x_3 \geq 0$$

- (2) Maximize $Z = 3x_1 + 2x_2 + x_3$

Subject to the constraints

$$2x_1 + 5x_2 + x_3 = 12$$

$$3x_1 + 4x_2 = 11$$

where, $x_2, x_3 \geq 0$ and x_1 unrestricted**OR**

- (A) Write the algorithm of revised simplex method. **9**
 (B) By using revised simplex method **9**

$$\text{Maximize } Z = 3x_1 + 2x_2$$

Subject to the constraints

$$2x_1 + x_2 \leq 10$$

$$-x_1 - 3x_2 \geq -6$$

where, $x_1, x_2 \geq 0$

2. (A) Explain Johnson's algorithm for sequencing problem. **9**
 (B) A book binder has one printing press, one binding machine and the manuscripts of a number of different books. The time required to perform the printing and binding operations for each books are shown below. Determine the order in which books should proceed in order to minimize the total time ? Also find idle time. **9**

Books	1	2	3	4	5	6
Printing time (hours)	30	120	50	20	90	110
Binding time (hours)	80	100	90	60	30	10

OR

- (A) Write the rules of sequencing problem. 9
 (B) There are 6 jobs each of which is to proceed through two machines A and B in the order A and B processing are as follows : 9

Job	1	2	3	4	5	6
Machine A	1	5	8	7	3	3
Machine B	5	6	5	2	2	10

Determine the optimum sequence for 6 jobs and minimum elapsed time. Also find the idle time of machine A and B.

3. (A) What is replacement problem ? Explain different types of failures. 9
 (B) The cost price of a machine is ₹ 12,200. Its maintenance cost is as follows and scrap value is ₹ 200, a constant. When should the machine be replaced ? 9

Year	1	2	3	4	5	6	7	8
Maintenance cost in ₹	200	500	800	1200	1800	2500	3200	4000

OR

- (A) Explain replacement model for items which deteriorate with time when value of money does not change with time and time is continuous variable. 9
 (B) The purchase price of a machine is ₹ 9000, the maintenance cost for first year is ₹ 500 and then increases by ₹ 1000 every year. When should the machine be replaced ? 9

4. Attempt any **eight** from the following : 16

- (1) Describe the changes in right hand side constants of the primal constraints when it is converted to the dual.
- (2) Describe the changes in the signs of inequality of the dual constraints when it is converted to the primal.
- (3) Write full form of FIFO and LIFO.
- (4) Write any two assumptions of sequencing problem.
- (5) If the primal variable is unrestricted in sign, what would be the type of associate dual constraint ?
- (6) Explain the meaning of group replacement of items.
- (7) If for the given replacement problem the average maintenance cost increases continuously then what decision is taken for that data ?
- (8) How replacement theory is useful in real life situations ?
- (9) How dual simplex method is different from simplex method ?
- (10) Explain total elapsed time and idle time on a machine in sequencing.
- (11) Define basic solution.
- (12) Optimal solution of the LPP satisfies _____, _____, _____.