Reg. No. : .....

Code No. : 40578 E Sub. Code : SEMA 5 D

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2019.

Fifth Semester

Mathematics — Core

Major Elective — OPERATIONS RESEARCH — I

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. In LPP the objective function subject to a set of linear equation (or) inequalities is known as

(a) Constraints

(b) Equations

(c) Objective function

(d) None

(b) Solve the following assignment problem :

	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

20. (a) Solve the following sequence problem

Job	A	B	C	D	E	F	G
Machine M_1	3	8	7	4	9	8	7
Machine M_2	4	3	2	5	1	4	3
Machine M_3	6	7	5	11	5	6	12

Or

(b) Use the graphical method solve the following 2 jobs 5 machines sequencing problem :

Job I	Sequence (Time in hrs)	A	B	C	D
		2	3	5	2
Job II	Sequence (Time in hrs)	D	C	A	B
		6	2	3	1

2. The leading element obtained in simplex table is also called

(a) Pivotal element

(b) Minimum element

(c) Bonded element

(d) Unbounded element

3. In a LPP the number of variables is 3 and the number of constraints is 2, then the constraints of the dual is ————.

(a) 2 (b) 3

(c) 6 (d) 4

4. The dual of the dual is

(a) Dual (b) Primal

(c) Optimum (d) Unbounded

5. A transportation problem is balanced if ————.

(a) Total supply > Total demand

(b) Total supply = 0

(c) Total supply = Total demand

(d) Total demand = 0

6. ———— method is used to find the initial basic feasible solution of a transportation problem.

(a) VAM (b) MODI

(c) Euler (d) Horney

7. The method of solving an assignment problem is

(a) Modi method (b) Hungarian method

(c) Vogel's method (d) Two-phase method

8. Assignment model is a special case of ————.

(a) Transportation (b) Sequencing

(c) Routing (d) None of these

9. The time for which the machine has no job to process is ———— on machine.

(a) Total time (b) Processing time

(c) Idle time (d) None

10. Sequencing problems involving processing of two jobs on 'n' machines

(a) can be solved by graphical method

(b) cannot be solved by graphical method

(c) have a condition that the processing of two jobs must be in the same order

(d) none of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Solve graphically the following LPP

Maximize $z = 4x_1 + 3x_2$

Subject to

$2x_1 - 3x_2 \leq 6$

$6x_1 + 5x_2 \geq 30$

$x_1, x_2 \geq 0.$

Or

(b) Write down the standard form of the following LPP :

Minimize $z = 2x_1 + 5x_2 + x_3$

Subject to

$x_1 + 3x_2 - 4x_3 \leq 20$

$2x_1 + x_2 + x_3 \geq 10$

$x_1 + 4x_2 + 5x_3 = 10$

$x_1, x_2, x_3 \geq 0.$

12. (a) Write down the dual of :

Maximize $z = 3x_1 + 10x_2 + 2x_3$

Subject to

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

$3x_1 - 2x_2 + 4x_3 = 3$

$x_1, x_2, x_3 \geq 0.$

Or

(b) Use dual simplex method to solve :

Maximize $z = 2x_1 + 3x_2$

Subject to

$2x_1 - x_2 - x_3 \geq 3$

$x_1 - x_2 + x_3 \geq 2$

$x_1, x_2, x_3 \geq 0.$

13. (a) Using North-west corner rule find an initial basic feasible solution for the following transportation problem :

	W_1	W_2	W_3	a_i
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	6	2	14
				34
b_j	2	9	18	29

Or

(b) Find the initial basic feasible solution for the following transportation problem using VAM method.

	D_1	D_2	D_3	D_4	
a_1	2	3	11	7	8
a_2	1	0	6	1	1
a_3	5	8	15	9	10
	7	5	3	2	

14. (a) Find the assignment that minimize the total unit cost.

	M_1	M_2	M_3
J_1	19	28	31
J_2	11	17	16
J_3	12	15	13

Or

(b) Solve the assignment problem

	A	B	C	D
X	18	24	28	32
Y	8	13	17	19
Z	10	15	19	22

15. (a) Determine the optimum sequence for the 5 jobs and minimum total elapsed time. Find also the idle time of machines M_1 and M_2.

Job	A	B	C	D	E
Machine M_1	5	4	8	7	6
Machine M_2	3	9	2	4	10

Or

(b) Determine the optimum sequence for the 8 jobs and minimum total elapsed time. Find also the idle time of machines M_1 and M_2.

Job	1	2	3	4	5	6	7	8
Machine M_1	14	26	17	11	9	26	18	18
Machine M_2	21	15	16	21	22	12	13	25

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Solve the following LPP by simplex method.

Minimize $z = x_1 - 3x_2 + 2x_3$

Subject to

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

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0.$

Or

(b) Solve the following by big M-method :

Maximize $z = x_1 + 2x_2$

Subject to

$2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0$.

17. (a) Solve by simplex method using dual of the following LPP

Minimize $z = 2x_1 + 3x_2$

Subject to

$x_1 + x_2 \geq 5$

$x_1 + 2x_2 \geq 6$

$x_1, x_2 \geq 0$.

Or

(b) Use dual simplex method to solve :

Minimize $z = 4x_1 + x_2$

Subject to

$3x_1 + x_2 \geq 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + x_2 \leq 4$

$x_1, x_2 \geq 0$.

18. (a) Solve the following transportation problem :

	$W1$	$W2$	$W3$	a_i
$F1$	8	10	12	900
$F2$	12	13	12	1000
$F3$	14	10	11	1200
b_j	1200	1000	900	3100

Or

(b) Solve the following transportation problem :

	D_1	D_2	D_3	D_4	a_i
S_1	3	1	7	4	300
S_2	2	6	5	9	400
S_3	8	3	3	2	500
b_j	250	350	400	200	1200

19. (a) Solve the following assignment problem :

	M_1	M_2	M_3
J_1	19	28	31
J_2	11	17	16
J_3	12	15	13

Or