

Reg. No. :

Code No. : 30586 E Sub. Code : SEMA 5 D

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2020.

Fifth Semester

Mathematics — Core

Major Elective II – OPERATIONS RESEARCH – I

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following is the main characteristics of standard form?
 - (a) All variables are non negative
 - (b) All variables are negative
 - (c) All constraints cannot be expressed as equation
 - (d) None

2. The graphical method can be applied only when the number of variables in LPP is only _____
- (a) 1 (b) 2
(c) 3 (d) 4
3. If a primal variable is positive then the corresponding dual constraint is _____ of the optimum.
- (a) An equation (b) \leq
(c) \geq (d) None
4. In the formulation of primal-dual pair, the number of dual constraints is always equal to _____
- (a) Number of primal constraints
(b) Number of dual variables
(c) Number of primal variables
(d) None
5. In a $m \times n$ transportation problem feasible solution exists when the number of basic cell is
- (a) $m+n-1$ (b) $m+n+1$
(c) $m-n-1$ (d) $m-n+1$

6. The other name for least cost method is _____
- (a) Matrix-Minima Method
 - (b) Column-Minima Method
 - (c) Row-Minima Method
 - (d) North West Corner Rule
7. Which one of the following method is an assignment method?
- (a) Hungarian
 - (b) NWC Rule
 - (c) VAM method
 - (d) MODI method
8. To convert a unbalanced Assignment problem into a balanced assignment problem we introduce a dummy row (or) column, These dummy row or column consists of _____ cost.
- (a) 0
 - (b) 1
 - (c) 2
 - (d) -1
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. Idle time = _____
- (a) Total elapsed time + Total working time
 - (b) Total working time – Total elapsed time
 - (c) Total elapsed time – Total working time
 - (d) None of these

PART B — ($5 \times 5 = 25$ marks)

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

Each answer should not exceed 250 words.

11. (a) Solve graphically the following problem:

$$\text{Minimize } z = 4x_1 + 3x_2$$

$$\text{Subject to } 2x_1 - 3x_2 \leq 6$$

$$6x_1 + 5x_2 \geq 30$$

$$x_1, x_2 \geq 0.$$

Or

- (b) Find a basic feasible solution to the following L.P.P

$$\text{Maximize } z = 5x_1 + 8x_2$$

$$\text{Subject to } 3x_1 - 2x_2 \geq 3$$

$$x_1 + 4x_2 \geq 4$$

$$x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0.$$

12. (a) Write down the dual of

$$\text{Maximize } z = 3x_1 + 10x_2 + 2x_3$$

$$\text{Subject to } 2x_1 + 3x_2 + 2x_3 \leq 7$$

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

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

Or

- (b) Use Dual simplex method to solve :

$$\text{Maximize } z = 2x_1 + 3x_3$$

$$\text{Subject to } 2x_1 - x_2 + x_3 \geq 3$$

$$x_1 - x_2 + x_3 \geq 2$$

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

13. (a) Explain VAM method.

Or

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

	D_1	D_2	D_3	D_4	
O_1	2	3	11	7	8
O_2	1	0	6	1	1
O_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.

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	1	2	3	4	5
Machine M_1	5	4	8	7	6
Machine M_2	3	9	2	4	10

Or

(b) Solve the following sequencing problem:

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Use Simplex method to solve the following LPP:

$$\text{Minimize } z = x_1 - x_2 + 2x_3$$

$$\text{Subject to } 3x_1 - x_2 + 2x_3 \geq 7$$

$$-2x_1 + 4x_2 \leq 12$$

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

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

Or

- (b) Solve the L.P.P by using Big-M Method :

$$\text{Minimize } z = 60x_1 + 80x_2$$

$$\text{Subject to } 20x_1 - 30x_2 \geq 900$$

$$40x_1 + 30x_2 \geq 1200$$

$$x_1, x_2 \geq 0.$$

17. (a) Solve by Simplex Method using dual of the following L.P.P :

$$\text{Minimize } z = 2x_1 + 3x_2$$

$$\text{Subject to } x_1 + x_2 \geq 5$$

$$x_1 + x_2 \geq 6$$

$$x_1, x_2 \geq 0.$$

Or

- (b) Use dual Simplex Method to solve

$$\text{Minimize } z = 4x_1 + x_2$$

$$\text{Subject to } 3x_1 + x_2 \geq 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + x_2 \leq 4$$

$$x_1, x_2 \geq 0.$$

18. (a) Solve the following Transportation problem.

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

Or

- (b) Solve the following Transportation Problem:

	I	II	III	IV	ai
A	20	21	16	18	10
B	17	28	14	16	9
C	29	23	19	20	7
bj	6	10	4	5	26 25

19. (a) Solve the following Assignment Problem:

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

Or

- (b) Solve the following Assignment problem:

	A	B	C	B
a	3	6	2	6
b	7	1	4	4
c	3	8	5	8
d	6	4	3	7
e	5	2	4	3
f	5	7	6	2

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