

Reg. No. : .....

Code No. : 41169 E Sub. Code : JMMA 5 E/  
JMMC 5 E

B.Sc. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2018.

Fifth Semester

Mathematics — Main

Optional Elective II — OPERATIONS RESEARCH

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ( $10 \times 1 = 10$  marks)

Answer ALL questions.

Choose the correct answer.

1. The leading element in a simplex table is called

- (a) pivotal element
- (b) minimum element
- (c) bounded element
- (d) unbounded element

- (b) A contractor has to supply 10,000 bearings per day to an automobile manufactures. He find that when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock. Per one year is 2 paise and the set up cost of a production run is Rs. 18. How frequently should production be made?



2. \_\_\_\_\_ variables are added to the LHS of the constraints of  $\leq$  types and subtracted from the constraints of  $\geq$  type.

- (a) Slack (b) Surplus  
(c) Neutral (d) None

3. The other name for least test method is \_\_\_\_\_

- (a) matrix minima method  
(b) column minima method  
(c) row-minima method  
(d) none

4. In the optimum solution of the assignment problem, a given row or column of the cost matrix have

- (a) no assignment (b)  $< 0$  assignment  
(c)  $\geq 2$  assignment (d) one assignment

5. The value of the game  $\begin{bmatrix} 5 & 0 \\ 0 & 2 \end{bmatrix}$  is \_\_\_\_\_

- (a) 0 (b) 2  
(c) 5 (d) none

6. Strategy is a \_\_\_\_\_

- (a) decision rule  
(b) dominance rule  
(c) value of the given game  
(d) none

7. The term commonly used for activity slack time is

- (a) free float (b) independent float  
(c) total float (d) all of these

8. \_\_\_\_\_ developed Critical Path Method (CPM).

- (a) Walker (b) Lemke  
(c) T.C. Koopmans (d) None

9. Holding cost is also called \_\_\_\_\_

- (a) set up cost  
(b) carrying cost  
(c) replenishment cost  
(d) none

10. The economic order quantity is given by \_\_\_\_\_

- (a)  $q^* = \sqrt{\frac{2c_3r}{c_1}}$  (b)  $q^* = \sqrt{2c_1c_3r}$   
(c)  $q^* = \sqrt{\frac{2c_1r}{c_3}}$  (d) none



PART B — (5 × 5 = 25 marks)

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

11. (a) Define basic solution, basic feasible solution, degenerate solution.

Or

- (b) Solve using simplex method :

$$\text{Maximize } z = x_1 + 4x_2 + 5x_3$$

Subject to :

$$3x_1 + 3x_2 \leq 22$$

$$x_1 + 2x_2 + 3x_3 \leq 14$$

$$3x_1 + 2x_2 \leq 14$$

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

12. (a) Solve the following transportation problem.

Sources    1    2    3    Capacities

1	2	2	3	10
2	4	1	2	15
3	1	3	0	40

Demand    20    15    30

Or

- (b) Describe an assignment problem.

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13. (a) Consider the game with the following pay-off matrix.

		B	
		B <sub>1</sub>	B <sub>2</sub>
A	A <sub>1</sub>	2	6
	A <sub>2</sub>	-1	$\mu$

- (i) Show that the  $\mu$ -same is strictly determinable.

- (ii) Find the value of the game.

Or

- (b) Explain :

- (i) Two person zero sum game and  
(ii) Pure and mixed strategies.

14. (a) Write notes on slack and floats in network.

Or

- (b) Construct a network diagram for the following :

Operations    Post operations

A    Precedes B, C

B    Precedes D, E

C    Precedes D

D    Precedes F

E    Precedes G

F    Precedes G

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15. (a) Derive the fundamental EOQ formula.

Or

- (b) Consider the inventory system with the following data in usual notation.

$r = 1000$  units/year  $I = 0.30$  P = Rs. 0.50/unit  
 $C_3 = \text{Rs. } 10$   $L = 2$  years (Lead time)

Determine the following :

- (i) Optimal order quantity
- (ii) Reorder point
- (iii) Minimum average list.

PART C — (5 × 8 = 40 marks)

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

16. (a) Solve the following L.P.P by simplex method.

Maximize  $z = x_2 - 3x_3 + 2x_5$

Subject to :

$$\begin{aligned} 3x_2 - x_3 + 2x_5 &\leq 7 \\ -2x_2 + 4x_3 &\leq 12 \\ -4x_2 + 3x_3 + 8x_5 &\leq 10 \\ x_2, x_3, x_5 &\geq 0. \end{aligned}$$

Or

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- (b) Test the nature of the following system of linear equations.

$$2x_1 + x_2 = 3$$

$$x_1 + x_2 = 1.$$

17. (a) Solve the following transportation problem.

	$D_1$	$D_2$	$D_3$	$D_4$	Supply
$O_1$	23	27	16	18	30
$O_2$	12	17	20	51	40
$O_3$	22	28	12	32	53
Demand	22	35	25	41	123

Or

- (b) Solve the following assignment problem.

	1	2	3	4
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

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18. (a) Solve the following game graphically.

	Player B	
Player A	-4	3
	-7	1
	-2	-1
	-5	-2
	-1	-6

Or

- (b) Solve the game whose pay off matrix is given by

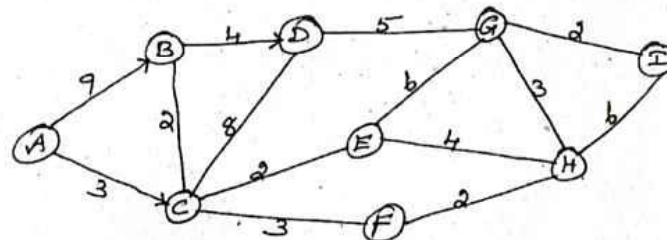
		B			
		I	II	III	IV
A	I	3	2	4	0
	II	2	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

19. (a) Draw a network for the following project.  
Also find the critical path and the duration.

Job :	A	B	C	D	E	F	G	H	I
Predecessor :	-	-	A	BA	BBD	EC	FD	EG	H
Time (days) :	15	10	10	10	5	5	20	10	5

Or

- (b) Find the critical path for the following network.



20. (a) Explain Economic lot size model with uniform rate of demand, infinite production rate and having no shortages.

Or

