

(i) Printed Pages : 7]

Roll No. ....

(ii) Questions : 14]

Sub. Code : 

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Exam. Code : 

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**B.B.A. 3rd Semester Examination**

**1127**

**OPERATION RESEARCH**

**Paper : BBA-202**

**Time : 3 Hours]**

**[Max. Marks : 80**

**Note :-** (i) Attempt any *four* questions from Section A.

Each question carries 5 marks.

(ii) Attempt any *two* questions each from Section B

and Section C. Each question carries 15 marks.

**Section-A**

1. Explain the following terms in relation to linear programming problem :

(a) Optimum solution

(b) Alternate solution

**NA-122**

( 1 )

Turn Over

2. What is an unbalanced transportation problem ?

How is such a problem handled and solution obtained ?

3. Solve the following transportation problem using

Matrix Minima method :

		Consumers			
		A	B	C	Available
Suppliers	I	6	8	4	14
	II	4	9	8	12
	III	1	2	6	5
Required		6	10	15	

4. Solve the game :

		B	
A	8	-3	
	-3	1	

NA-122

( 2 )

5. A firm manufactures two types of products A and B and sells them at a profit of Rs. 12 on product A and Rs. 13 on product B. Each product is processed on 2 machines G and H. Product A requires one minute of processing on G and 2 minutes on H; Product B requires one minute on G and one minute on H. The machine G is available for not more than 6 minutes while machine H is available for 10 minutes during any working day. Formulate as a linear programming problem.
6. Determine the assignment schedule and minimum cost for the following problem. The assignment costs are given below :

	Job				
	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
Person C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

### Section-B

7. What is operations research ? Discuss the scope of operations research.
8. Max. :

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

Subject to :

$$3x_1 + x_2 + 4x_3 \leq 600$$

$$2x_1 + 4x_2 + 2x_3 \geq 480$$

$$2x_1 + 3x_2 + 3x_3 = 540$$

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

9. Solve the following travelling salesman problem :

	1	2	3	4	5
1	—	16	12	26	43
2	8	—	12	14	12
3	9	15	—	10	17
4	13	16	32	—	19
5	8	10	14	18	—

10. Find optimal solution to the following transportation problem in which the cells contain the transportation cost in rupees :

	$W_1$	$W_2$	$W_3$	$W_4$	$W_5$	Available
$F_1$	7	6	4	5	9	40
$F_2$	5	7	7	8	6	10
$F_3$	6	8	9	6	5	20
$F_4$	8	5	6	7	8	30
Requirement	30	30	15	20	5	

### Section-C

11. Customers arrive at a sales counter named by a single person according to Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer in the queue and system.
12. Explain M/M/I and M/M/S queuing models in detail.
13. Seven jobs are to be processed through two machines A and B in the order AB. Processing time (in hours) are given below :

Jobs	1	2	3	4	5	6	7
Machine A	10	12	13	7	14	5	16
Machine B	15	11	8	9	6	7	16



14. Solve the following game by dominance method :

		Player Q			
		I	II	III	IV
Player P	I	6	4	8	0
	II	6	8	4	8
	III	8	4	8	0
	IV	0	8	0	16