(ii) Questions   : 14]   **Sub. Code :** | 0 | 8 | 7 | 4 |

Exam. Code : | 0 | 0 | 2 | 3 |

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

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
	I	6	8	4	14
Suppliers	II	4	9	8	12
	III	1	2	6	5
Required		6	10	15	

4. Solve the game :

	B	
A	8	−3
	−3	1

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 $x_1, x_2, x_3 \geq 0$.

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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	

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