(i) Printed Pages: 4 Roll No. .....

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

Exam. Code : 0 0 2 3

B.B.A. 3rd Semester

1128

OPERATION RESEARCH

Paper—BBA 202

Time Allowed : Three Hours] [Maximum Marks : 80

Note :— (1) Attempt any ***four*** questions from Section-A. Each question carries **5** marks.

(2) Attempt any ***two*** questions from Section-B. Each question carries **15** marks.

(3) Attempt any ***two*** questions from Section-C. Each question carries **15** marks.

SECTION—A

1. Discuss briefly the limitations of Operation Research Techniques.
2. Write short notes on :
   (i) Surplus variable
   (ii) Artificial variable in L.P.P.
3. Consider a modified form of "Matching biased coins" game problem. The matching player is paid Rs. 8 if the two coins turn both heads and Re 1 if the coins turn both tail. The non-matching player is paid Rs. 3 when the two coins do not match. Given the choice of being the matching or non-matching player, which one would you choose and what would be your strategy ?

4. A firm manufactures three products A, B and C. Profit per unit are Rs. 3, Rs. 2 and Rs. 4 respectively. The firm has two machines and required processing time in minutes for each machine on each product is given below :

		Products		
		A	B	C
Machine	X	4	3	5
	Y	2	2	4

Machine X and Y are available for 30 hours and 25 hours respectively. The firm must manufacture 100 units of A, 200 units of B and 50 units of C but not more than 150 units of A. Formulate the L.P.P. to maximize the profit.

5. Solve the following L.P.P. by Simplex method :

Max. $Z = 10x + 20y$

Subject to $x + 2y \leq 2$

$2x + 6y \geq 18$

where $x, y \geq 0$

6. Find the Initial Basic Feasible Solution to the following transportation problem by using North-West corner method :

	Warehouse				
	W1	W2	W3	W4	Supply
Factory F1	14	25	45	5	6
F2	65	25	35	55	8
F3	35	3	65	15	16
Requirement	4	7	6	15	30

SECTION—B

7. Define Operations Research. Give features of OR. Briefly discuss the techniques of Operations Research.

8. Solve the following L.P.P. by Graphical method :

Max. $Z = 80x + 120y$

Subject to $x + y \leq 9$

$x \geq 2$

$y \geq 3$

$20x + 50y \leq 360$

Where $x, y \geq 0$

9. Given below is a table. Solve it as a transportation problem and test its optimality :

		Centres				Available (units)
Factories	A	10	8	7	12	500
	B	12	13	6	10	500
	C	8	10	12	14	900
Demand		700	550	450	300	1900 / 2000

10. Tata has five plants each of which can manufacture any one of five products. Production costs differ from one plant to another as do sales revenue. Given the revenue and cost data below, obtain which product each plant should produce to maximize profit :

Sales Revenue (Rs.)

	Product 1	2	3	4	5
A	65	78	83	60	95
B	85	52	59	44	73
Plant C	83	56	69	64	78
D	49	80	85	84	73
E	59	68	83	74	83

Production Cost (Rs.)

	Product 1	2	3	4	5
A	33	40	43	32	45
B	45	28	31	23	37
Plant C	42	29	36	29	41
D	27	42	44	38	37
E	30	35	43	39	44

SECTION—C

11. Solve the following game :

		Player B	
		I	II
Player A	I	2	5
	II	2	3
	III	3	2
	IV	–2	8

12. A manufacturing company processes 6 different jobs on two machines A and B. No. of units of each job and its processing times on A and B are given in table. Find the optimal sequence, the total minimum elapsed time and idle time for each machine :

Job No.	No. of units of each Job	Processing Time	
		Machine A (Min.)	Machine B (Min.)
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

13. At Dr. Prachi's clinic, patients arrive at an average of 6 patients per hour. The clinic is attended by Dr. Prachi herself. The doctor takes 6 minutes per patient to serve them. It can be assumed that arrivals follow a Poisson distribution and the doctor's inspection time follows an exponential distribution. Determine :
    (i) The percent of time a patient can walk right inside the doctor's cabin, without having to wait.
    (ii) The average no. of patients in Dr. Prachi's clinic.
    (iii) The average no. of patients waiting for their turn.
    (iv) The average time a patient spends in the clinic.
14. Write notes on the following :
    (a) Sequencing Problems
    (b) Features of Queuing System
    (c) Significance of Game Theory.