UG–472 **BMS–09**

B.Sc. DEGREE EXAMINATION – JANUARY 2009.

(AY – 2005-06 and CY – 2006 batches only)

Third Year

Mathematics

LINEAR PROGRAMMING AND OPERATIONS RESEARCH

Time : 3 hours Maximum marks : 75

SECTION A — (5 × 5 = 25 marks)

Answer any FIVE questions.

1. Write the following linear programming problem in standard form.

Minimize $Z = 2x_1 - 3x_2 + x_3$

Subject to
$$-x_1 + 3x_2 \le -5$$
$$x_1 + 2x_2 + x_3 \le 6$$
$$x_1 + x_2 + x_3 \ge -8$$
$$x_1, x_2, x_3 \ge 0.$$

2. Explain the term artificial variables and its use in linear programming.

3. Explain the primal-dual relationship.

4. Give the mathematical formulation of an assignment problem. How does it differ from a transportation problem?

5. Obtain an initial basic feasible solution to the following transportation problem by using North West Corner Rule.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

6. Explain the following terms in inventory management.

(a) Carrying cost

(b) Shortage cost.

7. What is replacement? Describe some important replacement situations.

8. Explain : Minimax and Maximin principle used in the theory of games.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. Let $S = \{x_1, x_2 .... x_n\} \subseteq R^n$. Then prove that the set of all convex combinations of $\{x_1, x_2 .... x_n\}$ is a convex set in R^n.

10. Use simplex method to solve the following LPP :

Maximize $Z = 3x_1 + 2x_2$

Subject to
$$x_1 - x_2 \leq 1$$
$$3x_1 - 2x_2 \leq 6$$
$$x_1, x_2 \geq 0.$$

11. Solve the following assignment problem which minimises the total man hours.

$$\begin{array}{cc} & \begin{array}{cccc} A & B & C & D \end{array} \\ \text{Jobs} \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \end{array} & \begin{pmatrix} 18 & 26 & 17 & 11 \\ 13 & 28 & 14 & 26 \\ 38 & 19 & 18 & 15 \\ 19 & 26 & 24 & 10 \end{pmatrix} \end{array}$$

12. Solve the following unbalanced transportation problem.

To

From	5	8	6	6	3	800
	4	7	7	6	5	500
	8	4	6	6	4	900
	400	400	500	400	800	

13. Neon lights in an industrial park are replaced at the rate of 100 units per day. The physical plant orders the neon lights periodically. It costs Rs. 100 to initiate a purchase order. A neon light kept in storage is estimated to cost about Re. 02 per day. The lead time between placing and receiving an order is 12 days. Determine the optimum inventory policy for ordering the neon lights.

14. The cost of a machine is Rs. 6,100 and its scrap value is only Rs. 100. The maintenance costs are found from experience to be :

Year :	1	2	3	4	5	6	7	8
Maintenance cost :	100	250	400	600	900	1250	1600	2000

When should the machine be replaced?

15. Find out the optimum strategies for the following 2×2 game without saddle point.

$$\begin{array}{cc} & B \\ A & \begin{pmatrix} 5 & 1 \\ 3 & 4 \end{pmatrix} \end{array}$$

16. In the model $(M/M/1):(N/FIFO)$ find P_n.