(c) The cost of machine is Rs. 61,000 and its scrap value is Rs. 1,000. The maintenance cost found from past experiences is as follows-

Year	Maintenance cost in Rs.
1	1000
2	2500
3	4000
4	6000
5	9000
6	12000
7	16000
8	20000

When should the machine be replaced.

15. (a) Solve the following linear programming problems graphically-

Max $Z = 2x_1 + 3x_2$

Subject to $x_1 + x_2 \leq 1$

$3x_1 + x_2 \leq 4$

and $x_1, x_2 \geq 0$

(b) A manufacturing company processes 6 different jobs on two machine A and B. Number of unit of each job and its processing time on A and B are given below in table. Find the optimal sequence, the total minimum elapsed time and idle time for each machine.

Job No.	Processing Time		
	No. of unit of each job	Machine A (minutes)	Machine B (minutes)
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

Roll No.....

BCA-404 (N)

B.C.A. (Semester-IV) Examination-2014

(New Course)

Paper: Fourth

Optimization Techniques

Time: Three Hours] [Maximum Marks: 75

Note: Section A is compulsory. Attempt any seven questions from Section B and attempt any one question from Section C.

Section-A

Note: All questions are compulsory. Each question carries 6 marks. **(6x3=18)**

1. Discuss the scope and limitations of O.R.

2. Find all basic feasible solutions of following equations-

$2x_1 + 6x_2 + 2x_3 + X_4 = 3$

$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$

3. How will you process n jobs through 2 machines? Explain.

Section-B

Note: Attempt any seven questions. Each question carries 6 marks. **(7x6=42)**

4. Give the mathematical formulation of an assignment problem. Explain the Hungerian Method to solve A.P.

5. Solve the following problem using Simplex method-

Min $(z) = 2x_1 + 4x_2 + x_3 + x_4$

Subject to $x_1 + 3x_2 + x_4 \leq 4$

$2x_1 + x_2 \leq 3$

$x_2 + 4x_3 + x_4 \leq 3$

$x_1, x_2, x_3, x_4 \geq 0$

6. Is

		50	20
55			
30	35		25

an optimal solution of the transport problem:

					Available units
	6	1	9	3	70
	11	5	2	8	55
	10	12	4	7	90
Required units	85	35	50	45	215

If not, modify it to obtain the optimal solution.

7. A company has two grades of inspectors, I and II who are to be assign for a quality control inspection. It is required that at least 2,000 pieces be inspected per 8 hours day. Grade I inspector can check pieces 50 per hour with an accuracy of 97%. Grade II can check pieces 40 per hour with an accuracy of 95%. Wages of grade I inspector is Rs. 4.50 per hour and grade II is Rs. 2.50 per hour. Each time an error is made by an inspector, the cost to the company is one rupee. The company has available for the inspection job 10 grade I and 5 grade II inspector. Formulate this L.P.P.

8. What is the role of O.R. in decision making?

9. Solve this Assignment problem-

	I	II	III	IV	V	VI
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

10. A manufacturer has to supply 12,000 units of a product per year to his customer. The demand is fixed and known the shortage cost is assumed is to be infinite. The inventory holding cost is Rs. 0.20 per unit per month and the setup cost per run is Rs. 350. Determine,
    (i) The optimum run size q_0
    (ii) Optimum scheduling period to
    (iii) Minimum total variable yearly cost

11. Explain the following term in respect to queue-
    (i) Arrival pattern (ii) Service discipline
    (iii) Service distribution

12. Construct the dual of the primal problem-

$$\text{Max } Z = 3x_1 + 5x_2$$
$$\text{Subject to } 2x_1 + 6x_2 \leq 50$$
$$3x_1 + 2x_2 \leq 35$$
$$5x_1 - 3x_2 \leq 10$$
$$x_2 \leq 20$$
$$\text{where } x_1, x_2 \geq 0$$

13. What is replacement? Describes some important replacement situations.

Section-C

Note: Attempt any one question. Each question carries 15 marks. (15x1=15)

14. (a) Define inventory. What are the advantages and disadvantages of having inventories?

    (b) Define the EOQ formula $q_0 = \sqrt{\frac{2C_3R}{C_1}}$ where the symbols have usual meanings. State the assumptions in this formula.