

31. Solving the following assignment problem

	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

(5×8=40 Marks)

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(Pages: 4)

Name: .....

Reg. No. ....

THIRD SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2017

(Regular/Supplementary/Improvement)

(CUCBCSS-UG)

CC15UBCA3C06- OPERATIONS RESEARCH

(Complementary Course)

(2015 Admission onwards)

Time: Three Hours

Maximum: 80 Marks

**Part A**

Answer *all* questions. Each question carries 1 mark

- Which technique is used in finding a solution for optimizing a given objective, such as profit maximization or cost minimization under certain constraints?  
a) Quailing Theory    b) Waiting Line    c) Both A and B    d) Linear Programming
- For maximization LPP, the simplex method is terminated when all the net evaluations are  
a)  $< 0$     b) 0    c)  $\geq 0$     d)  $\leq 0$
- The method used for solving an assignment problem is called \_\_\_\_\_
- PERT starts for \_\_\_\_\_
- Inventories in general are build up to \_\_\_\_\_  
a) Satisfy demand during period of replenishment  
b) Carry reserve stocks to avoid shortages  
c) Keep pace with changing market conditions  
d) All of the above
- The scientific method in OR consists of \_\_\_\_\_  
a) judgment phase    b) research phase    c) action phase    d) all the above
- If the primal problem has an unbound solution then the dual problem has \_\_\_\_\_
- Which theory concerns making sound decisions under conditions of certainty, risk and uncertainty  
a) Game Theory    b) Network Analysis    c) Decision Theory    d) None of the above
- An activity which doesn't consume either any resource or time is known as  
a) predecessor    b) successor    c) dummy    d) none of the above
- For maximization LPP, the objective function coefficient for an artificial variable is  
a) +M    b) -M    c) +1    d) Zero

(10×1=10 Marks)

**Part B**

Answer *all* questions. Each question carries 2 marks

- Define basic variable and basic solution.
- What is a critical path

Turn over

13. Construct the dual of:

$$\text{Minimize } Z=4x_1+2x_2+x_3$$

Subject to,

$$x_1+x_2 \leq 10,$$

$$3x_1+x_2+x_3 \geq 23,$$

$$7x_1-x_3 = 6$$

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

14. What is a balanced transportation problem

15. What are the reasons for replacement

(5×2=10 Marks)

**Part C**

Answer **any five** questions. Each question carries 5 marks

16. Solve by Big-M Method.

$$\text{Max } Z= 3x_1- x_2$$

Subject to

17. What is a balanced transportation problem? What are its applications?

18. What is meant by an optimality test in a transportation problem?

19. A company buys a machine for Rs 6000/-. The maintenance cost is expected to be Rs 300/- in each year for the first 2 years and go up annually as follows 700,1000,1500,2000 and 2500. Assume the money is worth of 20% per year. When the machine should be replaced

20. A company produces 3 products A, B and C from three raw materials P, Q and R. One unit of product A requires 4 units of P and 6 units of Q. One unit of product B requires 4 units Q and 10 units of R and one unit of product C requires 6 units of P and 4 units of Q and 8 units of R. The company has 16 units of material P, 20 units of Q and 30 units of R. Profit per unit of products A, B and C are Rs.6, Rs.10 and Rs.8 respectively. Formulate the problem mathematically to maximize profit.

21. Solve the assignment problem

	Jobs				
	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6

D	4	3	1	0	3
E	9	5	8	9	5

**16U313**

22. Describe the method of processing two jobs through 'm' machines.

23. The following table gives the activities in a construction project and other relevant information

Activities	:	1-2	1-3	2-3	2-4	3-4	4-5
Duration	:	20	25	10	12	6	10

Draw the network diagram and find the critical path

(5×5=25 Marks)

**Part D**

Answer **any five** questions. Each question carries 8 marks

24. Write the steps to solve a linear programming problem using the simplex procedure.

25. Explain the steps for solving a transportation problem

26. Describe the EOQ problem with one price break

27. A contractor has to supply 20,000 units per day. He can produce 30000 units per day. The cost of holding a unit in stock is Rs. 3 per year and the set up cost per run is Rs.50. How frequently and of what size the production runs be made.

28. Solve the following problem by using two phase method

Maximize

$$Z = 10x_1+16x_2$$

Subject to

$$6x_1 + 4x_2 \geq 6,$$

$$2x_1 + 8x_2 \geq 8,$$

$$2x_1 + 2x_2 \leq 10,$$

$$x_1, x_2 \geq 0$$

29. What is a replacement problem? When does it arise? Describe various types of replacement situations and decisions with suitable examples.

30. Find the optimum order quantity for a product for which the price breaks are as follows

Range of Quantity	Purchase cost per unit
$0 \leq Q_1 < 100$	20
$100 \leq Q_2 < 200$	18(10% discount)
$200 \leq Q_3$	16(20% discount)

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost of the product and the cost of ordering is Rs. 25 per month