

**N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : MAY-2024**
COURSE NAME: M.Com.C.A **MAXIMUM MARKS: 75**
SEMESTER: II **TIME : 3 HOURS**

OPERATIONS RESEARCH**SECTION – A****(10 X 1 = 10 MARKS)****ANSWER THE FOLLOWING QUESTIONS.****MULTIPLE CHOICE QUESTIONS.****K1**

1. The values of the decision variables which satisfy the constraints are called _____ solution.
 - a. Optimal
 - b. Feasible
 - c. Objective
 - d. Graphical
2. The order of occurrence is known as _____
 - a. machine
 - b. sequence
 - c. possible
 - d. problem
3. The number of customers in the queue plus the number of customers receiving the service is called the _____ of the system.
 - a. Length
 - b. Waiting time
 - c. Number
 - d. Transient
4. _____ is a stock allowance to cover errors in forecasting the lead time on the demand during the lead time.
 - a. Buffer Stock
 - b. Demand
 - c. Lead time
 - d. Maximum
5. A network diagram is a graphical _____ of a project.
 - a. representation
 - b. technique
 - c. method
 - d. dependence

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.**K2**

6. Define Operations Research.
7. Interpret unbalanced assignment problem.
8. What is Queuing Theory?
9. What is an inventory?
10. Expand PERT.

SECTION – B**(5 X 5 = 25 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)**

11. a) Solve the following LPP by graphical Method:

$$\text{Min } Z = 3x_1 + 2x_2$$

$$\text{Subject to } 5x_1 + x_2 \geq 10$$

$$x_1 + x_2 \geq 6$$

$$x_1 + 4x_2 \geq 12$$

$$x_1, x_2 \geq 0$$

(OR)

b) **Define:** i) Slack variable ii) Surplus variable iii) Artificial variable

(CONTD.....2)

12.a) What are the steps involved in Hungarian method?

(OR)

b) Solve the following assignment problem using Hungarian method.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| A | 2 | 3 | 4 | 5 |
| B | 4 | 5 | 6 | 7 |
| C | 7 | 8 | 9 | 8 |
| D | 3 | 5 | 8 | 4 |

13.a) The cost pattern for 2 machine A & B when money value is not considered is given below:

| Year | Cost at the beginning of the year | |
|------|-----------------------------------|-----------|
| | Machine A | Machine B |
| 1 | 5000 | 8000 |
| 2 | 3000 | 1000 |
| 3 | 2000 | 1000 |

Find the cost pattern for each machine when money is work 10% per year and find which machine less costly.

(OR)

b) Western national bank is considering opening a drive in window for customer service. Management estimates that the customers will arrive for service at the rate of 15 per hour. The teller whom it is considering to staff the window can service customers at the rate of one every three minutes. Assuming Poisson arrivals and exponential service time. find (i) utilization of the teller (ii) average number in the waiting line (iii) average number in the system (iv) average waiting time in the line (v) average waiting time in the system.

14.a) If the annual demand is 600 units, the storage cost is Rs. 0.60 per year, per unit and the setup cost is Rs. 80 per run, find the optimum run size?

(OR)

b) Company buys in lots 500 boxes which is a 3 month supply. The cost per box is Rs. 125 and the ordering cost is Rs. 150. The inventory carrying cost is estimated at 20% of unit value. (i) What is the total annual cost of the inventory policy? (ii) How much money could be saved by employing the economic order quantity?

15.a) Explain the types of PERT network.

(OR)

b) The following data are the characteristics of a project.

| Activity | Immediate Predecessors | During in days |
|----------|---------------------------|----------------|
| A | --- | 2 |
| B | A | 3 |
| C | A | 4 |
| D | B, C | 6 |
| E | --- | 2 |
| F | E | 8 |

Draw the network diagram for the above project

Find the minimum project completion time and the critical path.

(CONTD..... 3)

SECTION – C

(5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) A company produces two types of pens, say A and B. pen A is a superior quality and pen B is a lower quality. Profits on pen A and pen B are Rs. 5 and Rs. 3 per pen respectively. Raw materials required for each pen A is twice as that of pen B. the supply of raw materials is sufficient only for 1000 pens of B per day. Per A requires a special clip and only 400 clips are available per day. For pen B only 700 clips are available per day. Find graphically the product mix so that the company can make maximum profit.

(OR)

b) Solve the following LPP using Simplex method

$$\begin{aligned} \text{Max } Z &= 45x_1 + 80x_2 \\ \text{Subject to} \quad 5x_1 + 20x_2 &\leq 400 \\ 10x_1 + 15x_2 &\leq 450 \\ x_1, x_2 &\geq 0. \end{aligned}$$

17.a) The textile emporium four salesman A, B, C & D each salesman can handle any counter. The service time of each counter when manned by each salesman is given below.

| | A | B | C | D |
|---|----|----|----|----|
| W | 41 | 72 | 39 | 52 |
| X | 22 | 29 | 49 | 65 |
| Y | 27 | 39 | 60 | 51 |
| Z | 45 | 50 | 48 | 52 |

How should the salesman we allocated to appropriate counters so as to minimize the total service time? Each salesman should handle only one counter.

(OR)

b) Use VAM to uptain initial basic feasible solution.

| | A | B | C | |
|-----|---|---|----|----|
| I | 2 | 7 | 4 | 5 |
| II | 3 | 3 | 1 | 8 |
| III | 5 | 4 | 7 | 7 |
| IV | 1 | 6 | 2 | 14 |
| | 7 | 8 | 18 | |

18. a) At a petrol bank customers arrive in a position process with an average time of 5 minits between arrivals. The time intervals between services follow exponential distribution with a meen time of 2 minits. By how much should the flow of customers be increased to justify the opening of a second service point if the management is willing to open the same provided the customer has to wait for 5 minits for the service?

(OR)

b) The truck owner finds from his past records that the maintenance cost per year of a truck whose purchase price is Rs. 8000 are as given below:

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------|------|------|------|------|------|------|------|------|
| Maintenance | 1000 | 1300 | 1700 | 2200 | 2900 | 3800 | 4800 | 6000 |
| Resale price Rs. | 4000 | 2000 | 1200 | 600 | 500 | 400 | 400 | 400 |

Determine at which time it is profitable to replace the truck?

(CONT'D..... 4)

19.a) Anil company buys its annual requirement of 36,000 units in six installments. Each unit costs Rs. 1 and ordering cost Rs. 25. The inventory carrying cost is estimated at 20% of unit value. Find the total annual cost of the existing inventory policy. How much money can be saved by using EOQ?

(OR)

b) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs. 50 per unit from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of product. Find.

- i. Economic lot size
- ii. The total optimal cost including the cost of materials

20.a) A project has the following time schedule

| Activity | Time in months | Activity | Time in months |
|-----------------|-----------------------|-----------------|-----------------------|
| 1-2 | 2 | 3-7 | 5 |
| 1-3 | 2 | 4-6 | 3 |
| 1-4 | 1 | 5-8 | 1 |
| 2-5 | 4 | 6-9 | 5 |
| 3-6 | 8 | 7-8 | 4 |
| | | 8-9 | 3 |

- (i) Construct the network
- (ii) Find the total float for each activity
- (iii) Find the critical path and the project duration.

(OR)

b) What is the difference between the CPM and PERT?
