

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2025 ONLY)

25PCC206

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : MAY-2026
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. A basic feasible solution of an LPP is said to be *degenerate* when:_____.
 a. All constraints are satisfied b. At least one basic variable has zero value
 c. Objective function is unbounded d. All variables are non-negative
2. The Hungarian method is mainly used to solve:_____.
 a. Transportation problems b. Assignment problems
 c. Sequencing problems d. Replacement problems
3. In queuing theory, a single-server model means_____.
 a. One customer only b. One service facility
 c. Infinite waiting space d. Multiple service channels
4. Which cost is minimized in the Economic Order Quantity (EOQ) model?
 a. Purchase cost b. Ordering cost and holding cost
 c. Shortage cost only d. Setup cost only
5. In CPM, the critical path is the path which has:_____.
 a. Maximum float b. Minimum duration c. Zero slack d. Highest cost

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.

K2

6. Why decision variables must in an LPP be non-negative?
7. Explain how balancing is achieved in an unbalanced assignment problem.
8. Explain the importance of arrival rate and service rate in a queuing system.
9. What is Economic Order Quantity (EOQ)?
10. Explain why the critical path is important in a project network.

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K3

11. a) Explain the procedure for solving a Linear Programming Problem using the graphical method with a suitable illustration.

(OR)

b) Use the graphical method to solve the following LP problem.
 Minimize $Z = 20x_1 + 10x_2$ subject to the constraints
 $x_1 + 2x_2 \leq 40, 3x_1 + x_2 \geq 30, 4x_1 + 3x_2 \geq 60$ and $x_1, x_2 \geq 0$

12.a) Solve the following Assignment Problem.

	J1	J2	J3	J4
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

(CONTD.....2)

(OR)

- 12.b) Find the sequence that minimizes the total elapsed time (in hours) required to complete the following tasks on two machines

Task	A	B	C	D	E	F	G	H	I
Machine1	2	5	4	9	6	8	7	5	4
Machine 2	6	8	7	4	3	9	3	8	11

- 13.a) Explain the main characteristics of a queuing system and their impact on system performance.

(OR)

- b) A firm is considering replacement of a machine, whose cost price is Rs. 12,200 and the scrap value is Rs. 200. The running (maintenance and operating) cost are found from experience are as follows:

Year	1	2	3	4	5	6	7	8
	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

- 14.a) Annual Consumption = 20,000 Units, Ordering and Material Receiving Cost Rs 20 Per Order, Annual Carrying Cost = 10% of inventory value, Cost of material Per unit = Rs 50 . Find out 1. EOQ in Units, 2. EOQ in Rupees.

(OR)

- b) Compute EOQ: Annual Consumption = 5000 Units, Unit Price = Rs 20, Order Cost = Rs 16, Storage Rate = 2% per Annum, Interest Rate = 12% per annum, Obsolescence rate = 6% per annum.

- 15.a) Differentiate between CPM and PERT in terms of time estimation and application

(OR)

- b) Identify the Critical Path.

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

SECTION – C

(5 X 8 = 40 MARKS)

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

- 16.a) Solve the following LPP by Simplex Method

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

$$\text{STC } x_1 + x_2 \leq 1$$

$$3x_1 + x_2 \leq 4$$

$$\text{Where } x_1, x_2 \geq 0$$

(OR)

- b) Solve the following LPP by Simplex Method

$$\text{Minimize } Z = 4x_1 + 3x_2$$

subject to the constraints

$$200x_1 + 100x_2 \geq 4,000,$$

$$x_1 + 2x_2 \geq 50,$$

$$40x_1 + 40x_2 \geq 1,400 \text{ and } x_1, x_2 \geq 0$$

- 17.a) Find total elapsed time and Idle time of Machines I, II and III.

Job	Machine I (Hrs)	Machine II (Hrs)	Machine III (Hrs)
A	3	4	6
B	8	3	7
C	7	2	5
D	4	5	11
E	9	1	5
F	8	4	6
G	7	3	12

(CONTD.....3)

(OR)

- b) Find the optimal Solution by MODI method

	P1	P2	P3	P4	SUPPLY
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
DEMAND	5	8	7	14	

18. a) The initial cost of a machine is Rs. 6100/- and its scrap value is Rs.100/-. The maintenance costs found from experience are as follows:

Year	1	2	3	4	5	6	7	8
Annual Maintenance Cost (Rs)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

(OR)

- b) In a self service store with one cashier, 8 customers arrive on an average of every 5 mins. And the cashier can serve 10 in 5 mins. If both arrival and service time are exponentially distributed, then determine
- Average number of customer waiting in the queue for average. (3.2)
 - Expected waiting time in the queue (0.033)
 - What is the probability of having more than 6 customers In the system (0.209)
- 19.a) Evaluate the advantages and limitations of different EOQ models in inventory management. Suggest how a company can decide the optimal ordering policy considering demand variability, carrying costs, and price discounts.

(OR)

- b) A company has an annual demand of 12,000 units. Ordering cost is ₹60 per order, carrying cost is ₹3 per unit per year, and shortage cost is ₹5 per unit per year. Find:
- EOQ
 - Maximum inventory level
 - Maximum shortage

- 20.a) A project schedule has the following characteristics

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time	4	1	1	1	6	5	4	8	1	2	5	7

From the above information, you are required to:

- Construct a network diagram.
- Compute the earliest event time and latest event time.
- Determine the critical path and total project duration.
- Compute total, free float for each activity

(OR)

- b) The following table shows the jobs of a network alongwith their time estimates.

Job	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
<i>a(days)</i>	1	2	2	2	7	5	5	3	8
<i>m(days)</i>	7	5	14	5	10	5	8	3	17
<i>b(days)</i>	13	14	26	8	19	17	29	9	32

Here, a is optimistic time, m is most likely time and b is pessimistic time estimate.

Draw the project network and find the probability that the project is completed in 40 days.
