

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2024 ONLY)

24UBM3A1

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS :NOVEMBER-2025
B.B.A **MAXIMUM MARKS: 75**
SEMESTER: III **TIME : 3 HOURS**

PART - III

GE-III Allied-III: MATHEMATICAL TECHNIQUES – II

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS.

(K1)

1. The first step in an Operation Research study is to ____
a) Develop a model b) Define the problem c) Collect data d) Implement the solution
2. What does the feasible region represent in an LPP?
a) The set of constraints b) The set of objective functions
c) The set of possible solutions d) The set of optimal solutions
3. What is the main objective of a transportation problem?
a) To minimize production costs b) To maximize sales revenue
c) To minimize transportation costs c) To optimize resource allocation
4. What happen when maximine and minimax values of the game are same?
a) No solution exists b) Solution is mixed
c) Saddle point exists d) None of these
5. In network analysis, the critical path is the ____
a) Shortest path through the network b) Longest path through the network
c) Path with the most activities d) Path with the least activities

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

6. What is Operations Research?
7. What is the objective of a linear programming problem?
8. What is the use of Hungarian method?

9. What is a payoff matrix in game theory?
 10. What is the difference between PERT and CPM?

SECTION – B **(5 X 5 = 25 MARKS)**

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

11. a) What is operations research and explain it.

(OR)

- b) Discuss the limitations of operations research.

12. a) A firm manufactures three products A,B,C. Time to manufacture product A is twice that for B and thrice that for C and they are to be produced in the ratio 3:4:5. The relevant data is given in table. If the whole raw material is engaged in manufacturing product A, 1600 units of this product can be produced. There is demand for atleast 300,250,200 units of products A,B and C and the profit earned per unit is Rs.50, Rs.40, Rs.70, respectively. Formulate the problem as a linear programming problem.

Raw material	Requirement per unit of product (kg)			Total availability (kg)
	A	B	C	
P	6	5	9	5,000
Q	4	7	8	6,000

(OR)

- b) Express the following LPP in the standard form.

$$\text{Maximize } z = 2x_1 + 3x_2 + x_3$$

$$\text{Subject to the constraints } 4x_1 - 3x_2 + x_3 \leq 6$$

$$x_1 + 5x_2 - 7x_3 \geq -4$$

$$x_1, x_3 \geq 0, x_2 \text{ is unrestricted.}$$

- 13.a) Calculate the assignment cost of assigning any one operator to any one machine is given in the following table.

		Operators			
		I	II	III	IV
Machine	10	5	13	15	
	3	9	18	3	
	10	7	3	2	
	5	11	9	7	

(OR)

- b) Determine the basic feasible solution to the following transportation problem by using North-West Corner Rule.

Sources	Distribution Centres				Supply
	D_1	D_2	D_3	D_4	
S_1	2	3	11	7	6
S_2	1	0	6	1	1
S_3	5	8	15	9	10
Requirements	7	5	3	2	

14. a) Reduce the size of the game whose matrix is given by

		Player B		
		I	II	III
Player A	I	-4	6	3
	II	-3	-3	4
	III	2	-3	4

(OR)

- b) If for a period of 2 hours in a day (8-10a.m.) trains arrive at a yard every 20 minutes but the service time continues to remain 36 minutes, then calculate for this period

- the probability that the yard is empty
 - average queue length
- on the assumption that the line capacity of the yard is limited to 4 trains only.

15. a) Consider the following data for the activities of a project:

Activity:	A	B	C	D	E	F
Immediate predecessors :	-	A	A	B,C	-	E
Duration (days) :	2	3	4	6	2	8

Draw the network for this project.

(OR)

- b) Write the procedure of PERT.

SECTION – C

(5 X 8 = 40 MARKS)

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

(K4 (Or) K5)

16. a) Discuss the various classification schemes of models.

(OR)

- b) Discuss the significance and scope of operations research in modern management.

17. a) Apply graphical method to solve the LPP Maximize $z = x_1 - 2x_2$
Subject to $-x_1 + x_2 \leq 1$, $6x_1 + 4x_2 \geq 24$, $0 \leq x_1 \leq 5$, $2 \leq x_2 \leq 4$.

(OR)

- b) Use simplex method to solve the LPP Maximize $z = 4x_1 + 10x_2$
subject to $2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$, $x_1, x_2 \geq 0$.

(CONTD ... 4)

18. a) Solve the transportation problem by MODI's method.

	D_1	D_2	D_3	D_4	Supply
S_1	21	16	25	13	11
S_2	17	18	14	23	13
S_3	32	27	18	41	19
Demand	6	10	12	15	

(OR)

- b) Solve the assignment problem represented by the matrix.

	1	2	3	4	5	6
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

19. a) Solve the following 2×5 graphically

		Player B				
		B_1	B_2	B_3	B_4	B_5
Player A	A_1	2	-1	5	-2	6
	A_2	-2	4	-3	1	0

(OR)

- b) A self-service store employs one cashier at its counter. An average of nine customers arrive every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming

Poisson distribution for arrival rate and exponential distribution for service rate, find

- Average number of customers in the system.
- Average number of customers in queue or average queue length.
- Average time a customer spends in the system.
- Average time a customer waits before being served.

20. a) A Project schedule has the following characteristics:

Activity:	1-2	1-3	2-4	3-4	3-5	4-9
Time(days):	4	1	1	1	6	5
Activity:	5-6	5-7	6-8	7-8	8-10	9-10
Time(days):	4	8	1	2	5	7

- Construct a network diagram.
- Compute the total float, free float and independent float for each activity.
- Find the critical path and total project duration.

(OR)

b) A small project is composed of activities whose time estimates are listed in the table below. Activities are identified by their beginning (*i*) and ending (*j*) node numbers.

Activity i-j	Estimated Duration (in weeks)		
	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- i) Draw the project network.
- ii) Find the expected duration and variance for each activity. What is the expected project length?
- iii) Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed
 - At least 4 weeks earlier than expected?
 - No more than 4 weeks later than expected time?
- iv) If the project is 19 due in weeks, what is the probability of meeting the due date?

Given:	Z	0.5	0.67	1.00	1.33	2.00
	p	0.1915	0.2486	0.3413	0.4082	0.4772
