

(FOR THE CANDIDATES ADMITTED

24UCS3A1

DURING THE ACADEMIC YEAR 2025 ONLY)

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS :NOVEMBER 2025

B.Sc -Computer Science(AIDED & SF)

MAXIMUM MARKS: 75

SEMESTER: III

TIME : 3 HOURS

PART - III

24UCS3A1– MATHEMATICS III: COMPUTER BASED OPTIMIZATION TECHNIQUES

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. What is the primary focus of Operations Research during World War II?
(a) Optimizing military production (b) Developing new weapons systems
(c) Optimizing military logistics and strategies(d) Improving communication system.
- 2.The method of solution of assignment problems is called _____ method.
(a) NWCR(b) VAM(c) LCM(d) Hungarian
- 3.What is the main focus of PERT?
(a) Resources (b) Cost (c) Time uncertainty (d) Quality
- 4.Which of the following is a measure of system reliability?
(a) Mean Time To Repair (MTTR) (b) Mean Time To Failure (MTTF)
(c) Mean Time Between Failures (MTBF)(d) All of the above
- 5.The sequencing problem deals with:_____
(a) Allocating resources to different projects.
(b) Determining the order in which jobs should be processed.
(c) Managing inventory levels.
(d) Calculating the cost of a project.

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

- 6.Define Objective Function.
- 7.What do you mean by degeneracy in a Transportation Problem?
- 8.Define free float.
- 9.Define saddle point.
- 10.Define ordering cost.

SECTION – B

(5 X 5 = 25 MARKS)

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

11. a) A company manufactures two products A and B. These products are processed in the same machine. It takes 10 minutes to process one unit of product A and 2 minutes for each unit of product B and the machine operates for a maximum of 35 hours in a week. Product A requires 1kg and B 0.5kg of raw material per unit, the supply of which is 600kg per week. Market constraints on product B is known to be minimum of 800 units every week. Product A costs \$5 per unit and sold at \$10. Product B costs \$5 per unit and can be sold in the market at a unit price of \$8. Formulate the LPP to maximize the profit.

(OR)

Ethical paper

(CONT...2)

b) Convert the following LPP into a Standard Form

Maximize $Z = 3x_1 + 2x_2 + 3x_3$ subject to the constraints:

$$2x_1 - 3x_2 \leq 3$$

$$x_1 + 2x_2 + 3x_3 \geq 5$$

$$3x_1 + 2x_3 \leq 2$$

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

12.a) Obtain an initial basic feasible solution to the following Transportation Problem using Least Cost Method.

		Destination			
Origin	D ₁	D ₂	D ₃	D ₄	Capacity
O ₁	1	2	3	4	6
O ₂	4	3	2	0	8
O ₃	0	2	2	1	10
Demand	4	6	8	6	

(OR)

b) Write the differences between Transportation Problem and Assignment Problem.

13.a) Draw a Network for the following project:

F < J; B < C, D; D < G; C < E, F; E < F; G < H; H < J; J < K. A is the starting event.

(OR)

b) A small project consists of seven activities for which the relevant data are given below. Draw the Network and find the Project Completion Time.

Activity	Preceding activities	Activity Duration(days)
A	-	4
B	-	7
C	-	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

14.a) A manufacturing has to supply his customer with 600 units of his product per year. Shortage is not allowed and the shortage cost amount to Rs.0.60 per unit year, the set-up cost per production run is Rs.80. Find the optimum run-size and the minimum average yearly cost.

(OR)

b) Solve the following Payoff matrix determine the optimal strategies and value of game

Player B

$$\text{Player A} \begin{bmatrix} 8 & -3 \\ -3 & 1 \end{bmatrix}$$

15a) Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines.

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

(OR)

b) Explain all Deterministic Inventory Models.

SECTION – C**(5 X 8 = 40 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.(K4 (Or) K5)**

16. a) What is the limitation of operation Research? Suggest the advantages of OR approach in decision making.**(OR)**

b) Use Graphical method to solve the following LPP:

Maximize $Z = 4x_1 + 10x_2$ subject to the constraints:

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 3x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

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

17.a) Find the initial solution to the following Transportation Problem to maximize the profit by Vogel's Approximation Method:

		Destination			
Sources	A	B	C	D	Supply
1	15	1	42	33	23
2	80	42	26	81	44
3	90	40	66	60	33
Demand	23	31	16	30	

(OR)

b) Solve the following Assignment Problem.

	A	B	C	D	E
1	4	3	6	2	7
2	10	12	11	14	16
3	4	3	2	1	5
4	8	7	6	9	6

18. a) A small maintenance project consists of the following jobs whose precedence relationship is drawn below.

Job	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration (Days)	15	15	3	5	8	12	1	14	3	14

(i) Draw an arrow diagram representing the project.

(ii) Find the total float for each activity.

(iii) Find the critical path and the total project duration. **(OR)**

b) A small project is composed of seven activities whose time estimates are listed in the table as follow:

Activity	Estimated Duration(weeks)		
	Optimistic	Most Likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
2-4	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 of each activity.

(iii) Calculate the Variance and show that of project length.

(CONT....4)

19.a) The cost of a machine is Rs.6,100 and its scrap value is Rs. 100. The maintenance costs found from experience are as follows. When should the machine be replaced?

Year:	1	2	3	4	5	6	7	8
Main cost (Rs.):	100	250	400	600	900	1200	1600	2000

(OR)

b) Use the notion of Dominance to sampling the following game and solve it graphically.

		Player B	
Player A	1	-3	
	3	5	
	-1	6	
	4	1	
	2	2	
	-5	0	

20.a) Find the sequence that minimizes the Total Elapsed Time required to complete the following jobs on machines M_1 , M_2 , and M_3 in the order M_1 , M_2 , and M_3 .

Task	A	B	C	D	E	F
M_1	8	3	7	2	5	1
M_2	3	4	5	2	1	6
M_3	8	7	6	9	10	9

(OR)

b) The annual demand of an item is 3200 units. The unit cost is Rs6 and inventory carrying charges 25% per annum. If the cost of one procurement is Rs 150 determine.

- Economic Order Quantity
- Number of Order r per year
- Time between two consecutive orders
- The optimal cost.
