(FOR THE CANDIDATES ADMITTED   SUBJECT CODE 23UCT2A1

DURING THE ACADEMIC YEAR 2023 ONLY)   REG.NO. _____

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

END-OF-SEMESTER EXAMINATIONS : MAY 2024

B.Sc. – COMPUTER TECHNOLOGY   **MAXIMUM MARKS: 75**

SEMESTER : II   **TIME : 3 HOURS**

PART – III

ALLIED II : MATHEMATICS II – OPERATIONS RESEARCH

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.
MULTIPLE CHOICE QUESTIONS.   **(K1)**

1. In simplex method, slack, surplus and artificial variables are restricted to be _____.

   (a) Multiplied   (b) Negative   (c) non negative   (d) divided

2. The assignment problem is said to be balanced if it is a ____ matrix.

   (a) Triangular   (b) Unit   (c) Rectangular   (d) Square

3. The penalty costs incurred as a result of running out of stock are known as _____ cost.

   (a) holding   (b) shortage   (c) set up   (d) purchase

4. In sequencing problem the order of completion of jobs is called _____.

   (a) completion sequence   (b) Job sequence   (c) processing order   (d) Job order

5. The performance of a specific task in CPM, is known as _____.

   (a) Dummy   (b) Event   (c) Activity   (d) Contract

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

6. Define linear programming.

7. What is an optimal solution in transportation problem?

8. State one reason for maintaining inventory.

9. Explain job sequence analysis.

10. Provide any one use of CPM technique.

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. Min. $Z = 40X_1 + 80X_2$ subject to

   constraints $72X_1 + 12X_2 \geq 216$,

   $6X_1 + 24X_2 \geq 72$,

   $40X_1 + 20X_2 \geq 200$,

   $X_1, X_2 \geq 0$.

(OR)

b) Use Simplex method to solve Max $Z = 5x_1 + 4x_2$ subject to $6x_1 + 4x_2 \leq 24$,

$$x_1 + 2x_2 \leq 6,$$
$$-x_1 + x_2 \leq 1,$$
$$x_2 \leq 2, x_1, x_2 \geq 0$$

12. a) Attain the initial feasible solution using North West Corner rule for the following Transportation.

Source	Destination				Supply
	D1	D2	D3	D4	
O1	5	3	6	2	19
O2	4	7	9	1	37
O3	3	4	7	5	34
Demand	16	18	31	25	90

(OR)

b) Solve the following assignment problem.

		Men		
		1	2	3
Task	P	9	26	15
	Q	13	27	6
	R	35	20	15
	S	18	30	20

13. a) A manufacturer uses Rs.10,000 worth of an item during the year. He has estimated the ordering costs as Rs.25 per order and carrying costs as 12.5% of average inventory value. Find the optimal order size, number of orders per year, time period per order and total cost.

(OR)

b) A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one month usage at a time. Each part costs Rs.20. The ordering cost per order is Rs. 15 and the carrying charges are 15% of the average inventory per year. Suggest a more economic purchasing policy for the company. How much would it save the company per year?

(CONTD …. 3)

ETHICAL PAPER

14. a) Strong Book Binder has one printing machine, one binding machine, and the manuscripts of a number of different books. Processing times are given in the following table:

Book	Time In Hours	
	Printing	Binding
A	5	2
B	1	6
C	9	7
D	3	8
E	10	4

Determine the order in which books should be processed on the machines, in order to minimize the total time required.

(OR)

b) Three jobs J_1, J_2, J_3 are to be assigned to three machines M_1, M_2, M_3. The processing costs are given in the cost matrix form as shown below. Find the assignment which will minimize the overall processing cost.

	M_1	M_2	M_3
J_1	19	28	31
J_2	11	17	16
J_3	12	15	13

15. a) Determine the optimum project duration and cost for the following data.

	Normal		Crash	
	Time	Cost	Time	Cost
Activity	(days)	(Rs)	(days)	(Rs)
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
2-5	10	100	5	400
3-4	5	100	1	200
4-5	3	80	1	100

Indirect cost is Rs.70 per day.

(OR)

b) Determine the early start and late start in respect of all node points and identify critical path for the following network.
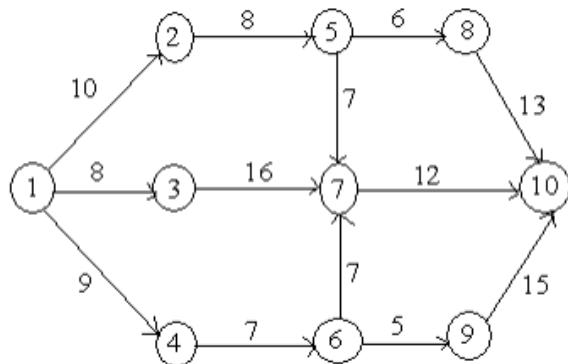
SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 (Or) K5)

16. a) A firm produces two products P and Q. Daily production upper limit is 600 units for total production. But at least 300 total units must be produced every day. Machine hours consumption per unit is 6 for P and 2 for Q. At least 1200 machine hours must be used daily. Manufacturing costs per unit are Rs. 50 for P and Rs. 20 for Q. Find optimal solution for the LPP graphically.

(OR)

b) Use Simplex method to solve Min $Z = -6x_1 - 10x_2 - 4x_3$ subject to

$$x_1 + x_2 + x_3 \leq 1000,$$
$$x_1 + x_2 \leq 500,$$
$$x_1 + 2x_2 \leq 700,$$
$$x_1, x_2, x_3 \geq 0$$

17. a) Solve the following transportation problem using North West Corner method and then find the optimal solution using MODI method.

	A	B	C	D	Supply
P	10	2	20	11	15
Q	12	7	9	20	25
R	4	14	16	18	10
Demand	5	15	15	15	

(OR)

b) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows. Determine the optimum assignment schedule.

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

18. a) Annual demand for an item is 2400 units. Ordering cost is Rs.100, inventory carrying charge is 24% of the purchase price per year. Purchase prices are

$$p_1 = \text{Rs. } 10 \quad \text{for purchasing } Q_1 < 500$$
$$p_2 = \text{Rs. } 9.25 \quad \text{for purchasing } 500 \leq Q_2 < 750$$
$$p_3 = \text{Rs. } 8.75 \quad \text{for purchasing } 750 \leq Q_3$$

Determine the optimum purchase quantity.

(OR)

b) The demand for an item each costing Re 1, is 10000 units per year. The ordering cost is Rs.10. Inventory carrying charge is 20% based on the average inventory per year. Stock-out cost is Rs.5 per unit of shortage incurred.

Find various parameters.

19. a) Find the solution of processing 5 jobs through 4 machines problem.

Job	1	2	3	4	5
Machine-1	11	13	9	16	17
Machine-2	4	3	5	2	6
Machine-3	6	7	5	8	4
Machine-4	15	8	13	9	11

(OR)

b) A book binder has one printing press, one binding machine and manuscripts of 7 different books. The times required for performing printing and binding operations for different books are shown below. Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all the books.

Book	1	2	3	4	5	6	7
Printing time (hours)	20	90	80	20	120	15	65
Binding time (hours)	25	60	75	30	90	35	50

(CONTD …. 6)

20. a) Draw the network diagram and determine the critical path for the following project:

Activity	1-2	1-3	1-4	2-5	3-6	3-7	4-7	5-8	6-8	7-9	8-9
Time estimate (Weeks)	5	6	3	5	7	10	4	2	5	6	4

(OR)

b) The following table shows the job of a network along with their time estimates.

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

Draw the project network and illustrate the probability of the project completing in 40 days.

ETHICAL PAPER

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