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Question Paper Code : 50051

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fifth Semester

Artificial Intelligence and Data Science

AD 8501 – OPTIMIZATION TECHNIQUES

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define LPP.
2. Why we use dual simplex method?
3. What is transportation problem and its application?
4. What is an example of a feasible solution?
5. What is an example of a PERT estimate?
6. What is an example of CPM?
7. What is Newton-Raphson method?
8. What is equality constraints and inequality constraints?
9. What are the three types of queuing systems?
10. What is the single channel model?

PART B — (5 × 13 = 65 marks)

11. (a) Solve the following linear programming problem using the graphical method.

Minimize: $Z = 5x + 4y$ $4x + y \geq 40,$ $2x + 3y \geq 90,$ $x, y \geq 0$

Or

- (b) Using the simplex method in LPP solve the linear programming problem
Minimize $Z = x_1 + 2x_2 + 3x_3$

$$x_1 + x_2 + x_3 \leq 12$$

$$2x_1 + x_2 + 3x_3 \leq 18$$

$$x_1, x_2, x_3 \geq 0$$

12. (a) Find solution using Branch and Bound method

$$MAX Z = 3x_1 + 5x_2$$

Subject to

$$2x_1 + 4x_2 \leq 25$$

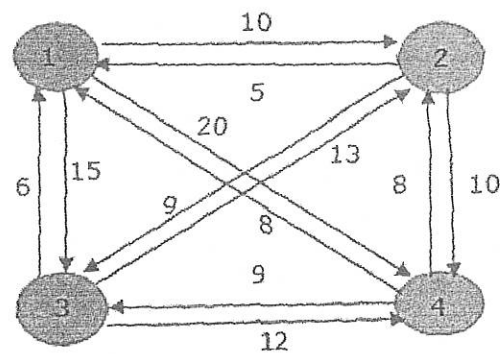
$$x_1 \leq 8$$

$$2x_2 \leq 10$$

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

Or

- (b) Solve the travelling salesman problem for the given graph.



13. (a) Explain in detail about the PERT chart and their steps involved for optimising the task to find the Red Color Ball from a Wooden Box. (13)

Or

- (b) Determine the critical path, the critical activities and the project completion time.

Activity	Predecessor Activity	Duration (Weeks)
A	-	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

14. (a) Sufficient condition for a stationary point X_0 to be an extremum is that the Hessian matrix H evaluated at X_0 satisfy the following conditions:

(i) H is positive definite if X_0 is a minimum point. (6)

(ii) H is negative definite if X_0 is a maximum point. (7)

Or

- (b) Explain Constraint problems with example.

15. (a) Explain in detail about multi-channel Queuing problem.

Or

(b) (i) What is Queuing Theory? (Definition And Characteristics) (7)

(ii) Standard Notation of Queuing Theory. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Orania Toys specializes in two types of wooden soldiers: Boer soldiers and British soldiers. The profit for each is R 28 and R 30, respectively. A Boer soldier requires 2 units of lumber, 4 hours of carpentry, and 2 hours of finishing to complete. A British soldier requires 3 units of lumber, 3.5 hours of carpentry, and 3 hours of finishing to complete. Each week the company has 100 units of lumber delivered and there are 120 hours of carpentry time and 90 hours of finishing time available. Determine the weekly production of each type of wooden soldier which maximizes the weekly profit.

Or

- (b) A company produces two types of cricket hats. Each hat of the first type requires twice as much labor time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second types to 150 and 250 hats, respectively. Assume that profits per hat are \$8 for type 1 and \$5 for type 2. Determine the number of hats to be produced of each type in order to maximize profits. Use the simplex method. Let x_1 be the number of cricket hats of type 1, and x_2 be the number of cricket hats of type 2.