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Paper Code : HM-HU601 Operations Research

UPID : 006650

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) What is WIP inventory?

(II) in LPP, dual of the dual is _____.

(III) In a transportation problem, when total supply is equal to total demand it is called a _____ transportation problem.

(IV) How a Maximization assignment problem is transformed into a minimization problem?

(V) What is the full form of CPM in Project management?

(VI) What is the distribution of service time in a M/M/1 queuing model?

(VII) What do you understand by Optimum solution in OR?

(VIII) If a primal problem has 2 constraint and 3 decision variables, then the number of constraint in the dual problem is _____.

(IX) In any transportation problem, if there are 4 supply location and 3 demand locations are there, how many constraint equations will be there in the mathematical model?

(X) TSP is an assignment problem with additional restriction. (True/False)

(XI) Which method is used for solving a LPP contains artificial variables?

(XII) In a transportation problem, there are 3 supply and 4 demand locations. How many minimum number of allocation to be there in the basic feasible solution for consideration the solution as feasible solution?

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. A television mechanic finds that the time spent to repair a set follows an exponential distribution with a mean time of around 30 minutes. If he repair the set in order which they came in and the arrival of the sets follows a poison distribution with an approximate average rate of 10 set in a 8 hours day, what is the repairman expected idle time in a day of 8 hours? What would be the expected no of TV set presence in the shop at any point of time? [5]

3. Write short note on EOQ with respect to Inventory management. [5]

4. Food X contains 6 unit of vitamin A per gram and 7 unit of vitamin B per gram and cost Rs 12 per gram. Food Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and cost Rs 20 per gram. The daily minimum requirement of vitamin A and vitamin B are 100 units and 120 unit respectively. The objective is to fulfil the minimum requirement of vitamin with minimum cost expenditure to buy the foods. Formulate the LPP for this problem. [5]

5. A company has three plants (A, B, C), each can supply of 7, 9 and 18 units respectively. There are four demand location (D1, D2, D3, D4) with a demand of 5, 8, 7, 14 units respectively. The table below, indicate the transportation cost from each plant location to each demand location: [5]
Use least cost method to find out the initial basic feasible solution for this problem.

	D1	D2	D3	D4
A	19	30	50	10
B	70	30	40	60
C	40	8	70	20

6. Rewrite the following LPP in standard form: [5]
Minimize Z = 2X1+ X2+ 4X3
Subject to

$-2X1+4X2 \leq 4$
$X1+2X2+X3 \geq 5$
$2X1+3X3 \leq 2$
$X1, X2 \geq 0$
X3 Unrestricted in sign (can be both positive and negative)

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Describe about the various type of model used in OR, classified based on their function, structure and nature of environment. [6]

(b) Name the three phases involves in any scientific method. Also, write down the name of the activities associated in each phases. [5]

(c) What are the shortcomings in Operations Research? [4]

8. (a) A company manufacturing two products namely product A and product B with high and low quality with a profit of Rs 4 and Rs 3 per piece respectively. Product A required twice manufacturing time that of product B and if only the product B is manufactured, the company can make 1000 pieces of product B in one day. Raw material 1, which is a common raw material for both the product, is required one piece each for both the products. Supply of raw material 1 is limited to 800 pieces per day. Product A is required a special packaging which is available only 400 pieces per day and similarly the packaging for product B is available only 700 pieces per day. Formulate the LPP and solve it by graphical method to determine the optimum product mix. Also determine the maximum profit. [9]

(b) With the help of three neat sketches, explain the following three exceptional cases in LPP. [6]
(a) Alternate maxima, (b) Unbounded Solution and (c) Infeasible solution

9. For the following activities, draw the project network diagram and find out overall project completion time and the total cost of this project. The indirect cost is Rs. 50/day. [15]
If this project need to be crashed by 3 days in total, what are the activities need to be crashed. What will be revised project cost in that case.

		Normal		Crash	
Activity	Preceding Activity	Time (days)	Cost (Rs)	Time (days)	Cost (Rs)
A	none	3	300	2	400
B	A	3	30	3	30
C	A	7	420	5	580
D	A	9	720	7	810
E	B	5	250	4	300
F	C,D,E	6	320	4	410
G	F	4	400	3	470
H	F	13	780	10	900
I	G	10	1000	9	1200

10. (a) A LPP is stated as follows: [5]
Minimize $Z = 20X + 10Y$
Subject to
$5X + Y \geq 6$
$2X + 2Y \geq 8$
$X, Y \geq 0$
Write down the dual LPP of the following primal LPP.

(b) Solve the above primal LPP by applying either two phase or Big- M method [10]

11 (a) In the perspective of decision making process, explain following.
Degree of Knowledge
Decision alternatives
States of Nature
Payoff
Payoff Matrix

(b) Write short note on Decision Tree analysis [5]

(c) Explain the decision making process adopted under different (four level) degree of Knowledge of any system. [5]

*** END OF PAPER ***