

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – III • EXAMINATION – WINTER 2012

Subject code: 731402

Date: 26/12/2012

Subject Name: Operation Research in Construction

Time: 10.30 am – 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the stages involved in the OR approach to problem solving. **07**
- (b) Discuss the steps involved in the graphical solution method of solving the LPP. What are the limitations of this method? **07**

- Q.2** (a) Use the graphical method to solve the following LP Problem. **07**
Maximize Profit $Z = 400X_1 + 200X_2$,
Subject to Constraints: $18X_1 + 3X_2 \leq 800$,
 $9X_1 + 4X_2 \leq 600$,
 $X_2 \leq 150$,
 $X_1, X_2 \geq 0$
Give your comments on obtained solution.
- (b) Solve the following LPP by the simplex method: **07**
Max $Z = 3X_1 + 2X_2$,
Subject to Constraints: $2X_1 + X_2 \leq 12$,
 $6X_1 + 5X_2 = 40$,
 $X_1, X_2 \geq 0$

OR

- (b) What do you mean by Infeasibility and Unboundness in LPP? **07**
Construct the dual of following primal Problem:
Minimize $(Z) = 5X_1 - 6X_2 + 4X_3$
Subject to: $3X_1 + 4X_2 + 6X_3 \geq 9$; $X_1 - 2X_2 + 4X_3 \geq 4$;
 $X_1 + 3X_2 + 2X_3 \geq 5$; $2X_1 + 5X_2 - 3X_3 = 9$;
 $7X_1 - 2X_2 - X_3 \leq 10$; $X_1, X_2, X_3 \geq 0$
- Q.3** (a) What are LPPs? What are the necessary and sufficient conditions for the application of the LP model? **07**
- Q.3** (b) There are three machines on which the products could be processed. **07**
Each unit of product A, product B & product C has machine hour requirements as given in the table. The contribution margin of the three products and available machine hours on the machines I, II, III are given in the table.

Machine	Products	Maximum
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				)
I	3	4	2	120
II	2	1	2	54
III	1	3	2	105
Profit (rs.)	36	42	32	--

Formulate the problem as LPP.

OR

- Q.3 (a)** The following matrix gives payoff in Rs. of different strategies S1, S2, S3 against states of nature N1, N2, N3, N4. **07**

Strategy	States of nature			
	N1	N2	N3	N4
S1	4000	-100	6000	18000
S2	20000	5000	400	0
S3	20000	15000	-2000	1000

Which strategy should the concerned manager choose on the basis of maximax criterion, Laplace criterion and Hurwitz criterion for degree of optimism = 0.7

- (b)** Explain the term 'EVPI'. How does one calculate the same, using which data? **03**

Does the dual of any LPP exist? What are the advantages of formulating the dual of any primal LPP? **04**

- Q.4 (a)** Calculate and tabulate expected monetary value and conclude which of the course of action can be chosen as the best using following payoffs of three acts P1, P2, P3 and three events Q1, Q2, and Q3. **07**

State of nature	Probability	Nature of demand		
		P1	P2	P3
Q1	0.10	25	-10	-125
Q2	0.70	400	440	400
Q3	0.20	650	740	750

- (b)** Construction manager is considering drilling a well at project site. In past, only 70% of wells drilled were successful at 20m depth in that area. Moreover on finding no water at 20m some persons in that area drilled it further up to 25m but only 20% struck water at that level. The prevailing cost of drilling is Rs.500/m. The manager estimated that in case he does not get water in his own well, he will have to pay Rs.15000 to buy water from outside for the same period of getting water from the well. The following decisions are considered. **07**

Do not drill any well

Drill up to 20m.

If no water is available at 20m, drill further up to 25m.

Determine construction manager's strategy using decision tree approach.

OR

- Q.4** State whether following statements are true/false with due **14**

justification.

The Laplace criterion is least conservative while minimax criterion is the most conservative.

In case of payoffs represented as profits, the savage criterion for selecting optimal course of action will be based on the maximin principle.

For each strategy in a given case, expected payoff + expected regret = a constant (EPPI) would hold.

Mixed strategy for a player can involve no more than two strategies.

It is possible that multiple minimax / maximin strategies might exist in a two player game.

The dominance principle suggests that strategies of one player are dominating the strategies of other player.

A given utility function holds for a given individual at a given point of time only.

Q.5 (a) Define the transportation problem and give its mathematical model. **07**

(b) Solve following transportation problem to the maximum iterations possible. **07**

Source	Destination				Supply
	1	2	3	4	
1	15	18	22	16	30
2	15	19	20	14	40
3	13	16	23	17	50
Demand	20	20	25	35	100

OR

Q.5 (a) Explain **07**

Utility function, Utility measure & Utility curve.

(b) For the following payoff matrix, find the value of the game and strategies for the player A and player B. **07**

		Player B		
		1	2	3
	1	3	-1	4
Player A	2	6	7	-2
