Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – III • EXAMINATION – WINTER • 2013

Subject code: 731402 **Date: 28-11-2013**

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) Describe methodology of operational research. **07**

(b) Discuss difference between decision making under certainty, uncertainty and risk. **07**

Q.2 (a) Explain slack variables, surplus variables and artificial variables with suitable examples. **07**

(b) Enlist course of action , state of nature, pay off and regret with suitable examples. **07**

OR

(b) Enlist and explain assumptions underlying linear programming model. **07**

Q.3 (a) A construction project involves placement of 1000 cum of concrete and completion of 500 cum of masonry per week. The constraints on labour and equipment permit the contractor to complete only 1500 cum of concreting or 1000 cum masonry or a weighted sum of two such that the sum of weights equal one. A profit of Rs.200 per cum of concrete and Rs.100 per cum of masonry is stipulated by the contractor. Only formulate linear programming problem. **07**

(b) Explain 1. Expected value of sample information. (EVSI). Efficiency index of sample information. How are EVSI and efficiency of index determined? **07**

OR

Q.3 (a) What is a model? Explain icon analogue and deterministic model with suitable example. **07**

(b) Solve graphically the following linear programming problem. Minimize $Z=3X_1 + 5X_2$ **07**

Subject to $-3X_1 + 4X_2 \leq 12$, $2X_1 - X_2 \geq -2$, $2X_1 + 3X_2 \geq 12$,

$X_1 \leq 4$, $X_2 \geq 2$

and $X_1, X_2 \geq 0$.

Q.4 (a) Explain primal dual relationship. What is the significance of Duality theory of linear programming? Explain with suitable example. **07**

(b) Explain utility function, utility measure and utility curve. **07**

OR

Q.4 (a) Following table source pay off (in rupees) **07**

Product acceptance	Full	partial	Minimal
Good	8000	70000	50000
Fair	50000	45000	40000
Poor	-25000	-10000	0

Determine optimal decision by Maximax, Maximin and Minmax regret principle.

(b) IOC is considering whether to go for an offshore drilling contract to be awarded in oil field with sea. If they bid, value would be Rs, 600 million with a 65% chance of gaining the contract. OIC may set up a new drilling operation or move already existing operation. which has proved successful, to new site. The probability of success and expected returns are as follows. **07**

Outcome	New drilling operation		Existing operation.	
	Probability	Expected revenue Rs.(million)	Probability	Expected revenue Rs.(million)
Success	0.75	800	0.85	700
Failure	0.25	200	0.15	350

If the corporation does not bid or loose contract, they can use Rs. 600 million to modernize their operations. This would results in a return of either 5% or 8% for sum invested with probabilities 0.45 and 0. 55 respectively.

Construct a decision tree for the data. Advice OIC whether to bid or not.

Q.5 (a) What is theory of game? State assumptions underlying theory of game. **07**

(b) Following table is an intermediate solution showing transportation cost from plants to warehouses and unit supplied to each warehouse from each plant. **07**

Warehouses	I	II	III	IV	Supply
Plant A	6	2 10	0	5	10
Plant B	7	7	3	8 15	15
Plant C	9 2	9	4 18	12	20
Plant D	12 6	9 2	5	11 7	15
Demand	8	12	18	22	60

Is this solution feasible? Is this solution degenerate? Is this solution optimal? If it is not optimal, find out optimal solution. Is optimal solution unique? If no, find out alternative solution.

OR

Q.5 (a) Find the optimal strategies for A & B in the following game. Also obtain value of the game. **07**

		Strategy Of B		
		B1	B2	B3
Strategy of A	A1	10	9	-8
	A2	4	-7	5
	A3	7	8	-8

(b) Enlist & explain various methods for finding initial feasible solution of a transportation problem. **07**

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