Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **M.Tech**

IMPC101

1st Semester Back Examination 2016-17

DECISION MODELLING - I

BRANCH: INDUSTRIAL ENGG

Time: 3 Hours

Max Marks: 70

Q.CODE:Y1231

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) Explain the terms 'Slack Variable' and 'Artificial Variable'.

b) Put the following problem in standard matrix form

Maximize: $z = x_1 + 2x_2$

Subject to: $5x_1 + x_2 \geq 15$

$4x_1 + 3x_2 \leq 30$

x_1 and x_2 are non-negative number

c) Briefly explain the Sensitivity Analysis in Linear Programming Problem.

d) Write the dual problem of following LP problem.

Minimize 6x1 + 5x2

Subject to

$x_1 + 2x_2 \geq 30$

$4x_1 + 3x_2 \geq 50$

$5x_1 + 4x_2 \geq 80$

e) Show how transportation problem can be expressed as a LP problem.

f) Show how assignment problem is a special case of transportation problem.

g) What do you mean by dominance in Game theory?

h) Show the formulation of Integer Programming problem.

i) Show how assignment problem is a special case of transportation problem.

j) What is Transhipment problem?

Q2 **a)** A company has two plants, each of which produces and supplies two products: A and B. The plants can each work up to 16 hours a day. In plant 1, it takes three hours to produce 1 unit of A and one hour to produce 1 unit of B at cost of Rs.15000 and Rs.28000 respectively. In plant 2, it takes two hours to produce 1 unit of A and 1.5 hours to produce 1 unit of B at cost of Rs.18000 and Rs.26000 respectively. The company is obliged to produce daily at least 8 units of A and 10 units of B. **(10)**

Formulate this problem as an LP model to find out as to how the company should organize its production so that the required amounts of the products be obtained at the minimum cost

Q3 **a)** Solve Linear Programming problem by Simplex method **(5)**

Maximise $3x_1 + 2x_2$

Subject to:

$2x_1 + x_2 \leq 4$

$3x_1 + 4x_2 \geq 24$

$x_1, x_2 \geq 0$

Q4 a) Five warehouses are supplied by three factories. The supply available from each factory, the demand at each warehouse and the cost per unit of transporting goods from the factories to the warehouses are summarized in the following table: **(5)**

Factory	Warehouse					Supply
	W1	W2	W3	W4	W5	
F1	4	2	3	2	6	8
F2	5	4	5	2	1	12
F3	6	5	4	7	7	14
Demand	4	5	6	7	8	

Find the optimal solution.

Q5 a) Six salespersons are to be allocated to six regions. The earning of each salesperson (Rupees in thousands) at each region is given below. Find an allocation to maximize total earning. **(5)**

Salesman	Products					
	R1	R2	R3	R4	R5	R6
S1	32	38	40	30	40	35
S2	40	24	28	28	36	32
S3	41	27	33	30	37	40
S4	22	38	41	36	36	34
S5	29	33	40	35	39	38
S6	38	34	42	38	40	36

Find the assignment of salesman to the products so as to maximize sales.

Q6 a) Solve the following Integer Programming Problem **(5)**

Maximize:

$z = 7x_1 + 9x_2$

Subject to:

$-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

Where x_1 and x_2 are non-negative integers

Q7 a) What is meant by a two player zero-sum game? **(3)**

b) Payoff matrix for player-A is given below. **(7)**

		Player B			
		I	II	III	IV
Player B	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

Determine optimal strategy for both players and value of game.

Q8 Write short answer on any TWO: **(5 x 2)**

a) Degeneracy in transportation problem

b) Minimal Spanning Tree Algorithm

c) Vogel Approximation method