Registration No: | | | | | | | | | | |

Total Number of Pages: 2 **M.TECH**
IMPE201

2nd Semester MTech Regular/Back Examination – 2014-15
DECISION MODELLING – II
BRANCH(S): INDUSTRIAL ENGINEERING
Time: 3 Hours
Max Marks: 70
Q.CODE:T303
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1. Answer in brief [2x10]

a) List various components of a system.
b) Write how systems can be classified.
c) Explain the meaning of 'Steady State'.
d) Distinguish between local optima and global optima.
e) Probability transition matrix of a Markov chain is as shown below then determine the steady state of sysetm

$$\begin{vmatrix} 0.4 & 0.4 & 0.2 \\ 0.2 & 0.5 & 0.3 \\ 0.3 & 0.3 & 0.4 \end{vmatrix}$$

f) State the principle of optimality for multi-stage dynamic programming.
g) Write the standard notation system to classify queuing systems.
h) State a situation where Poisson distribution can be used.
i) Write the important characteristics of uniform random number.
j) Write the advantages of simulation.

Q2. a) What is meant by non-linear optimization problem? Explain with suitable example. [4+3+3]
b) Distinguish between constrained and unconstrained non-linear optimization problem.
c) List various methods used for solving non-linear optimization problem.

Q3. Show that the following problem can be made separable. [10]

Maximize $z = x_1 x_3 + x_2 + x_2 x_3$

Subject to $x_1 x_3 + x_1 + x_2 x_3 \leq 100$

$x_1 , x_2 , x_3 \geq 0$

Q4. The weather in a certain place is classified as sunny, cloudy (without rain) and rainy. A sunny day is followed by a sunny day 60% of the time, and by a cloudy day 25% of the time. A cloudy day is followed by a cloudy day 35% of the time, and by a rainy day 25% of the time. A rainy day is followed by a cloudy day 40% of the time, and by another rainy day 25% of the time. If Monday is a cloudy day, what is the probability that it will be sunny day on next Thursday? [10]

Q5. A company has nine salespersons that have to be allocated to three sales regions. The expected volume of sales in a region depends on number of salespersons posted to that region as given below. The company

Number of Sales persons	Expected volume of sales in different regions		
	Region 1	Region 2	Region 3
0	90	50	80
1	110	90	110
2	140	120	130
3	160	150	150
4	180	160	170
5	190	170	190
6	200	175	200
7	210	180	210
8	220	185	220
9	225	185	230

How many salespersons should be posted in different regions for maximization of sales? [10]

Q6. Average arrival rate of customers to a service centre is 15 per hour. It takes about 3 minutes to serve one customer. Determine the following:

i. Average idle time of the service centre
ii. Average time a customer waits in a queue to be served
iii. Average time a customer spends in the service centre
iv. Average length of queue

If the arrival rate of customers to a service centre is increased to 25 per hour then what is the length of queue in the long run? [10]

Q7. a) Explain a method for generating random numbers.
b) Write steps to be followed in Discreet Event Simulation. [5+5]

Q8. Write short notes on any TWO: [5+5]

a) Kuhn-Tucker condition.
b) Application of Simulation
c) Random variate generation