## Master of Arts Examination 2018 (2<sup>nd</sup> year 3<sup>rd</sup> semester) Economics

## **Operations Research**

Time: 2 Hours Full Marks: 30

Answer any three questions:

3X10

- 1) For a game, two unbiased coins are tossed. If both show heads, the point will be doubled; point will remain same if two die show two different sides; point will become thrice otherwise. The states are enumerated as whether the points are divisible by 3; have remainder 1 while divided by 3; and have remainder 2 while divided by 3.
  - a) Find the transition probability matrix for the process.

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- Find out the probability of absorption from each transient state to each absorbing state, if the chain is absorbing; otherwise find the fixed probability vector.
- Find out the probability of reaching first state exactly after 3 moves, if the starting probability vector is given as

- 2) Answer the following questions:
  - a) What do you mean by ergodic Markov Process?

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b) Define regular Markov Process.

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c) What is meant by mean recurrence time?

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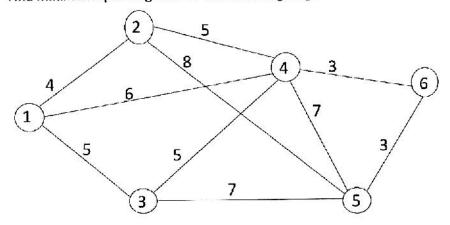
d) Find out mean recurrence times for the following Markov Process:

- 3) For a company producing 2 goods, using 3 resources, profits obtained from 1 unit of the 2 goods are 2 units and 5 units respectively. For the production of each unit of first good, 1 unit of first resource and 1 unit of second resource is required; and for the production of each unit of second good, 2 unit of second resource and 1 unit of third resource is required. The endowments of the 3 resources are given as 5 units, 4 units and 4 units respectively.
  - a) Will there be a change in the solution, if the endowment of third resource is enhanced to 2.5 units instead of 2 units?
  - b) Latter it was found that the correct profit obtained from the 2 goods are 3 units and 4 units respectively. Will there be a change in the solution?
- 4) Define any five terms from the following:

5X2

- a) Graph
- b) Node

- c) Directed Path
- d) Cycle
- e) Tree
- f) Spanning Tree
- g) Complete graph
- h) Bipartite graph
- 5) Find minimum spanning tree for the following diagram:



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