

Master of Arts Examination 2018
(2nd year 3rd 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. 4
- b) 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. 3
- c) Find out the probability of reaching first state exactly after 3 moves, if the starting probability vector is given as 3

$$u = \begin{bmatrix} 0.3 & 0.4 & 0.3 \end{bmatrix}$$

- 2) Answer the following questions:
- a) What do you mean by ergodic Markov Process? 2
- b) Define regular Markov Process. 2
- c) What is meant by mean recurrence time? 2
- d) Find out mean recurrence times for the following Markov Process: 4

$$P = \begin{matrix} & \begin{matrix} A & B & C & D \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \end{matrix} & \begin{bmatrix} 0.4 & 0 & 0.2 & 0.4 \\ 0.2 & 0.1 & 0.4 & 0.3 \\ 0.3 & 0 & 0.2 & 0.5 \\ 0.5 & 0.1 & 0.3 & 0.1 \end{bmatrix} \end{matrix}$$

- 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? 5
- 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? 5
- 4) Define any five terms from the following: 5X2
- a) Graph
- b) Node

[Turn over

- 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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