AI1110
Assignment 7

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Question

Classify the states of the Markov chains with the following transition probabilities :

1. $P = \begin{pmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}$
2. $\begin{pmatrix} 0 & 0 & \frac{1}{3} & \frac{2}{3} \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$
3. $\begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 & 0 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & \frac{1}{3} & \frac{2}{3} & 0 \\ 0 & 0 & \frac{2}{3} & \frac{1}{3} & 0 \\ \frac{1}{3} & \frac{1}{3} & 0 & 0 & \frac{1}{3} \end{pmatrix}$

Solution for part 1 & 2

1.
   - Period of state A $= \{2, 3, 4 \ldots\}$
   - Period of state B $= \{2, 3, 4 \ldots\}$
   - Period of state c $= \{2, 3, 4 \ldots\}$

   Chain is irreducible and aperiodic.
2.
   - Period of state A $= \{3, 4, 6, 7 \ldots\}$
   - Period of state B $= \{3, 4, 6, 7 \ldots\}$
   - Period of state C $= \{3, 4, 6, 7 \ldots\}$
   - Period of state D $= \{3, 4, 6, 7 \ldots\}$

   Chain is irreducible and aperiodic.

Solution for part 3

- Period of state A $= \{1, 2, 3, 4 \ldots\}$
- Period of state B $= \{1, 2, 3, 4 \ldots\}$
- Period of state C $= \{1, 2, 3, 4 \ldots\}$
- Period of state D $= \{1, 2, 3, 4 \ldots\}$
- Period of state E $= \{1, 2, 3, 4 \ldots\}$
  Chain has two aperiodic closed sets $\{e_1, e_2\}$ and $\{e_3, e_4\}$ and a transient state e_5 .