

Observations

- (a) every odd state is communicating with every other odd state.
- (b) every even state is " " " "
- (c) every state has a self loop.

$C(1) = \{1, 3, 5, 7, 9, 11\}$ closed class

$C(2) = \{2, 4, 6, 8, 10\}$ closed class

Clearly, chain is not irreducible.

Every state has a self loop, so each state is aperiodic. Hence, chain is aperiodic.

In a finite closed class, states are +ve recurrent.

∴ option (d) is Correct.

(2) Same as que (1) but has

$P_{14} > 0$ & $P_{25}^{(3)} > 0$

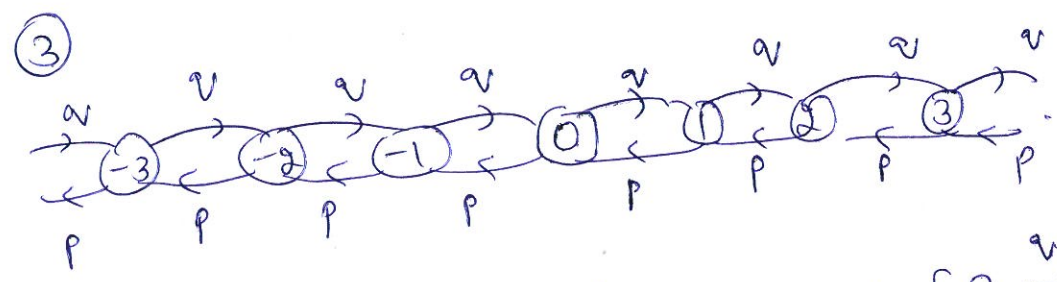
ie. even to odd is possible
odd to even is possible.

∴ Every state is communicating with every other state & has a self loop.

∴ Irreducible & aperiodic chain.

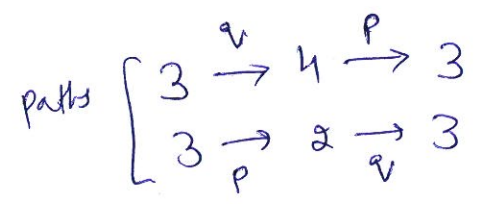
It is finite, so finite irreducible implies all states are +ve recurrent.

∴ (c) is correct.



$$P(X_5 = 3 | X_3 = 3)$$

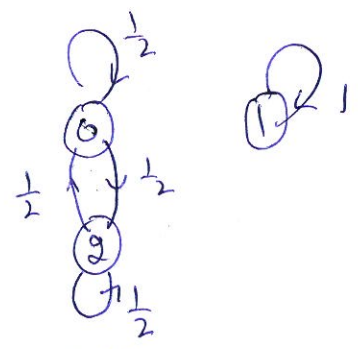
$$= 2pq$$



(b)

(4)

$$P = \begin{pmatrix} 1/2 & 0 & 1/2 \\ 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \end{pmatrix}$$



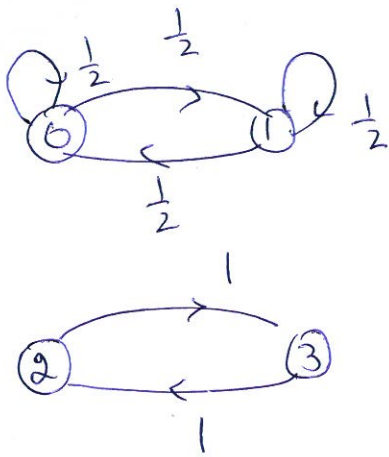
$$C(1) = \{1\}, C(0) = \{0, 2\}$$

⇒ Chain is ~~irreducible~~ & aperiodic.

Both the classes are closed, so states are +ve recurrent.

∴ (d) is correct.

5



2 closed classes

⇒ all states are +ve recurrent

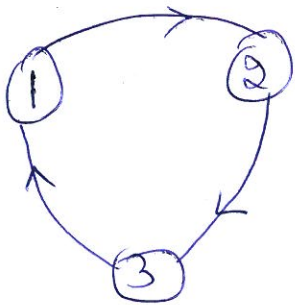
⇒ Reducible chain.

⇒ period of 0, 1 is 1
period of 2, 3 is 2

∴ chain is not aperiodic.

∴ option (d) is

6



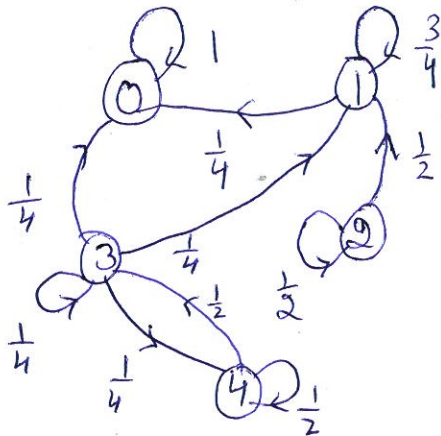
$$P(X_{121}=3, X_{152}=1)$$

$$= 1 \quad \left[\begin{array}{l} \because X_{121}=3 \\ \Rightarrow X_{122}=1 \\ X_{125}=1 \\ X_{128}=1 \\ \vdots \\ X_{152}=1 \end{array} \right]$$

(sure event)

option (c)

7



State 0 is absorbing.

$2 \rightarrow 0$ [0 is accessible from 2]

$3 \rightarrow 0$

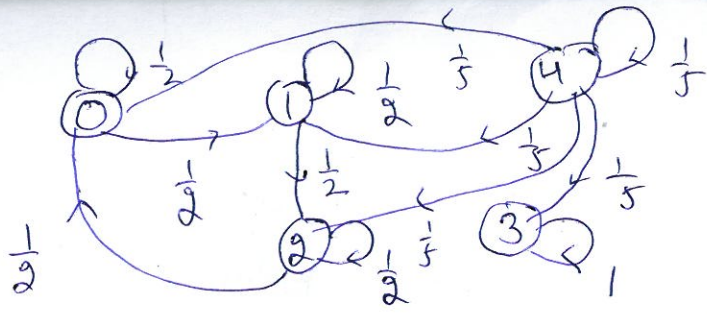
$4 \rightarrow 0$

$1 \rightarrow 0$

∴ only state 0 is recurrent.

option (d) is

8



$C(0) = \{0, 1, 2\} \rightarrow$ closed class

$C(3) = \{3\} \rightarrow$ closed class

$C(4) = \{4\}$

\therefore states 0, 1, 2, 3 are recurrent

& state 4 is transient.

option (b).

Corrections in Assignment

- Q 5 a) true replaced by false
 b) option (a), irreducible replaced by reducible
 c) option (d), only one.

Q 7 a) option (d) only state 0 is recurrent