Name:		Class	Test-1
Roll N	Ouastlan	Marks:15 Time: 1	
1.	Suppose a village has three soft drink shops (shop 1, shop 2, shop 3) along the main road in the sequence \rightarrow shop 1 \rightarrow shop 2 \rightarrow shop 3 \rightarrow . A customer decides after every pint whether he moves to the next soft drink shop on the left or on the right, and he chooses each option with the same probability. If there is no soft drink shop in this direction, he stays where he is for another pint. Let X_n is the position (shop number) of customer on with pint	Answer $ \begin{array}{l} \text{Answer} \\ \text{Answer} \end{array} $ $ \begin{array}{l} \text{Tr}_1 = \frac{1}{3} \end{array} $	Marks
2.	For which of the following transition probability matrices is the corresponding Markov chain irreducible? (a) $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$, (b) $\begin{pmatrix} 0.1 & 0.0 & 0.9 \\ 0.6 & 0.1 & 0.3 \\ 0.7 & 0.0 & 0.3 \end{pmatrix}$, (c) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ (i) Only (a), (ii) Only (b), (iii) Only (c), (iv) both (a) and (b), (v) both (a) and (c), (vii) both (b) and (c), (vii) all (viii)	(i) onlyk)	1
3.	Consider a Markov chain with state space $S = \{0, 1, 2, 3, 4, 5\}$ and tpm given by $ \mathbf{P} = \begin{cases} 0.3 & 0 & 0.2 & 0.2 & 0.3 & 0 \\ 0.3 & 0 & 0.2 & 0.2 & 0.3 & 0 \\ 0.3 & 0 & 0 & 0.4 & 0.3 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0.4 & 0.2 & 0.4 & 0 \\ 0 & 0 & 0 & 0 & 0.5 & 0.5 \\ 0 & 0 & 0 & 0 & 0.2 & 0.8 \end{cases} $	(G) (11, [2, 31, (7, 5]) (7, 5] (7, 5] Treumust transient (G)	1
4.	(a) Identify the classes of markov chain.(b) Determine the recurrent states (c) Determine the transient states. Consider a DTMC $\{X_n\}$, with state space $S = \{1, 2, 3\}$, and tpm		
	$\mathbf{P} = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1/3 & 2/3 \\ 2/5 & 3/5 & 0 \\ 1/4 & 3/4 & 0 \end{pmatrix}$		1
	and initial distribution $P(X_0 = 1) = 2/5$, $P(X_0 = 2) = 1/5$ and $P(X_0 = 3) = 2/5$. Compute (a) $P(X_1 = 2, X_2 = 2, X_3 = 1 X_0 = 1)$; (b) $P(X_3 = 1 X_2 = 2, X_1 = 2, X_0 = 1)$; (c) $P(X_1 = 3, X_2 = 2, X_3 = 1)$; (d) period of state 1	© 2/25 = 0.08	3 1
5. 3.	A state <i>i</i> of the Markov chain of state space S, is called recurrent if the probability of ever returning to state <i>i</i> i.e. f_{ii}^* is	= 1 (equal to)	
). '.	John is in iail and has 3 dollars; he are the first had been detailed by the second of	Yes	1
	dollars. A guard agrees to make a series of bets with him. If John bets A dollars, he wins A dollars with probability 0.7 and loses A dollars with probability 0.3. Find the probability that he wins 8 dollars before losing all of his money if	@ 0,9223	(
	(a) he bets 1 dollar each time (timid strategy).	6 0.637	1
	(b) he bets, each time, as much as possible but not more than necessary to bring his fortune up to 8 dollars (bold strategy).	(c) timid	
	(c) Which strategy gives Smith the better chance of getting out of jail?(timid/bold)		

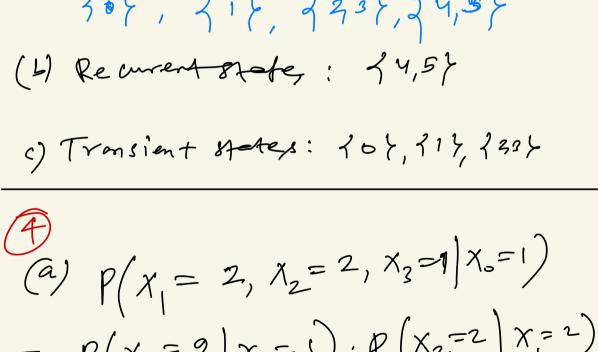
Sol

Name:	ess and Simulation (MA41017/MA6006		School Section (Control of Control of Contro
Roll No.			1 hour
Q.No. Question		Answer	Marks
 Suppose a village has three s along the main road in t shop 3 →. A customer decid to the next soft drink shop chooses each option with the drink shop in this direction, Let X_n is the position (shop (a) Determine the transition 	-	(a) \frac{1}{2}	1
shop 2. 2. For which of the following to corresponding Markov chain			
(i) Only (a), (ii) Only (b), (b), (v) both (a) and (c), (v) None.	$\begin{pmatrix} 0.1 & 0.0 & 0.9 \\ 0.6 & 0.1 & 0.3 \\ 0.7 & 0.0 & 0.3 \end{pmatrix}$, $(c) \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ (iii) Only (c) , (iv) both (a) and (iv) both (b) and (c) , (vii) all $(viii)$	(1) only(a)	
tpm given by	h state space $S = \{0, 1, 2, 3, 4, 5\}$ and $\begin{bmatrix} 2 & 3 & 4 & 5 \\ 0.2 & 0.2 & 0.3 & 0 \\ 0.2 & 0.2 & 0.3 & 0 \end{bmatrix}$	9 [11, {0,2,3,4,5}	
$\mathbf{P} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0.3 & 0 \end{pmatrix}$	0.2 0.2 0.3 0 0 1 0 0 0.4 0.2 0.4 0 0 0 0.5 0.5 0 0.4 0.3 0 0 0 0.2 0.8	(9) [11, {0,2,3,4,5} 7) recurrent (9)	1
(a) Identify the classes of marrent states (c) Determine the	rkov chain.(b) Determine the recurtransient states.	tranient ©	1
	h state space $S = \{1, 2, 3\}$, and tpm		,
$\mathbf{P} = 1 \begin{pmatrix} 2/2 \\ 0 \\ 1/2 \end{pmatrix}$	$\begin{pmatrix} 5 & \frac{7}{3} / 5 & 0 \\ 0 & 1 / 3 & 2 / 3 \\ 4 & 3 / 4 & 0 \end{pmatrix}$		
$P(X_0 = 3) = 2/5$. Compute (= 1) = $2/5$, $P(X_0 = 2) = 1/5$ and a) $P(X_1 = 2, X_2 = 2, X_3 = 1 X_0 = 1)$	© 0	1
$P(X_3 = 1), X_2 = 2, X_1$ $2, X_3 = 1); (d) period of state$ $A state i of the Markov chain$	$P(X_1 = 3, X_2 = 1)$ of state space S is called transient.	a period 1	. 1
The true $\begin{pmatrix} 1 & 0 \\ 0 \end{pmatrix}$ is rem	rning to state i i.e. f_{ii}^* is ular? (Yes/No)	<1 (ley than 1)	1
7. John is in jail and has 2 dollar	s: he can get out on bail if he h	No	1
bets A dollars, he wins A dollars with probability 0.3. I dollars before losing all of his	Re a series of bets with him. If John ars with probability 0.7 and loses A Find the probability that he wins 8 money if	9 0.8172	1
(a) he bets 1 dollar each time (b) he bets, each time, as mu	Ich as possible but not	6 0.49	1
necessary to bring his fort	une up to 8 dollars (hold stratom)	C timid	1

Stoo	chastic Process/Stochastic Process and Simulation (MA41017/MA6006		
	No.	Class Marks:15 Time:	Test-1
Q.N		Answer	Marks
1.	Suppose a village has three soft drink shops (shop 1, shop 2, shop 3) along the main road in the sequence \rightarrow shop 3 \rightarrow shop 2 \rightarrow shop 1 \rightarrow . A customer decides after every pint whether he moves to the next soft drink shop on the left or on the right, and he chooses each option with the same probability. If there is no soft drink shop in this direction, he stays where he is for another pint. Let X_n is the position (shop number) of customer on n th pint.	(a) O	
	(a) Determine the transition probability P_{22} .	(b) $\frac{1}{2}$	
	(b) Determine the long run probability that customer will be in shop 3.	3	1
2.	For which of the following transition probability matrices is the corresponding Markov chain irreducible?	. 0	
	(a) $\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix}$, (b) $\begin{pmatrix} 0.1 & 0.0 & 0.9 \\ 0.6 & 0.1 & 0.3 \\ 0.7 & 0.0 & 0.3 \end{pmatrix}$, (c) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0.5 & 0.5 \\ 0 & 0 & 1 \end{pmatrix}$	(1) only (9)	
	(i) Only (a), (ii) Only (b), (iii) Only (c), (iv) both (a) and (b), (v) both (a) and (c), (vi) both (b) and (c), (vii) all (viii) None.		
3.	Consider a Markov chain with state space $S = \{0, 1, 2, 3, 4, 5\}$ and tpm given by $\circ \circ \circ$	(G)	1
	$\mathbf{P} = \left(\begin{array}{cccccccc} 0.3 & 0 & 0.2 & 0.2 & 0.3 & 0 \\ 0.3 & 0 & 0.2 & 0.2 & 0.3 & 0 \\ 0.3 & 0 & 0 & 0.4 & 0.3 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.5 & 0.5 \\ 0 & 0 & 0 & 0 & 0.2 & 0.8 \\ 0 & 0 & 0.4 & 0.3 & 0.4 & 0 \end{array} \right)$	101,(11,52,3,4,53	
	$\mathbf{P} = \begin{bmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.5 & 0.5 \end{bmatrix}$	The T	
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	101,111,12,3,4,53 77 70 20 20 20 20 20 20 20 20 20 20 20 20 20	1
	(a) Identify the classes of markov chain.(b) Determine the recurrent states (c) Determine the transient states.		
4.	Consider a DTMC $\{X_n\}$, with state space $S = \{1, 2, 3\}$, and tpm	(d) 0	
	$\mathbf{P} = \begin{pmatrix} 2/5 & 3/5 & 0\\ 0 & 1/3 & 2/3\\ 1/4 & 3/4 & 0 \end{pmatrix}$	60	
	and initial distribution $P(X_0 = 1) = 2/5$, $P(X_0 = 2) = 1/5$ and	© 0	
	$P(X_0 = 3) = 2/5$. Compute (a) $P(X_1 = 2, X_2 = 2, X_3 = 1 X_0 = 1)$; (b) $P(X_3 = 1 X_2 = 2, X_1 = 2, X_0 = 1)$; (c) $P(X_1 = 3, X_2 = 2, X_3 = 1)$; (d) period of state 1	(d) persod=1	
5.	A state i of the Markov chain of state space S, is called recurrent if the probability of ever returning to state i i.e. f_{ii}^* is	= ((egnel to 1)	1
6.	The tpm $\begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$ is regular? (Yes/No)	No	1
7.	John is in jail and has 3 dollars; he can get out on bail if he has 8 dollars. A guard agrees to make a series of bets with him. If John	6 4	,
	bets A dollars, he wins A dollars with probability 0.6 and loses A dollars with probability 0.4. Find the probability that he wins 8 dollars before losing all of his money if	9 0.7323	}
	(a) he bets 1 dollar each time (timid strategy).	(b) 0,504	(
	(b) he bets, each time, as much as possible but not more than necessary to bring his fortune up to 8 dollars (bold strategy).		, , , , , , , , , , , , , , , , , , ,
	(c) Which strategy gives Smith the better chance of getting out of jail?(timid/bold)	C) timid	

Stocha Name:	stic Process/Stochastic Process and Simulation (MA41017/MA6006		x6fFep Test-1
Roll N		Marks:15 Time:	
Q.No.	Question	Answer	Marks
1.	Suppose a village has three soft drink shops (shop 1, shop 2, shop 3) along the main road in the sequence \rightarrow shop 1 \rightarrow shop 3 \rightarrow shop 2 \rightarrow . A customer decides after every pint whether he moves to the next soft drink shop on the left or on the right, and he chooses each option with the same probability. If there is no soft drink shop in this direction, he stays where he is for another pint.	$\bigcirc \frac{1}{2}$	1
	Let X_n is the position (shop number) of customer on n th pint. (a) Determine the transition probability P_{22} .	6 -	j
	(b) Determine the long run probability that customer will be in shop 1.		
2.	For which of the following transition probability matrices is the corresponding Markov chain irreducible?		
	$(a) \left(\begin{array}{ccc} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{array}\right), (b) \left(\begin{array}{ccc} 0.1 & 0.0 & 0.9 \\ 0.6 & 0.1 & 0.3 \\ 0.3 & 0.7 & 0.0 \end{array}\right), (c) \left(\begin{array}{ccc} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{array}\right)$	(iv) both (a) and (b)	
	(i) Only (a), (ii) Only (b), (iii) Only (c), (iv) both (a) and (b), (v) both (a) and (c), (vi) both (b) and (c), (vii) all (viii)None.		
3.	Consider a Markov chain with state space $S = \{0, 1, 2, 3, 4, 5\}$ and tpm given by $O \setminus O \setminus$	(a) (b)(1),(1),(4,5)	1
	$\mathbf{P} = \begin{pmatrix} 0.3 & 0 & 0.2 & 0.2 & 0.3 & 0 \\ 0 & 0 & 0.4 & 0.2 & 0.4 & 0 \\ 0.3 & 0 & 0 & 0.4 & 0.3 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0.5 & 0.5 \\ 0 & 0 & 0 & 0 & 0.2 & 0.8 \end{pmatrix}$	townsient recurrent	(
	(a) Identify the classes of markov chain.(b) Determine the recur-		1.
	rent states (c) Determine the transient states. Consider a DTMC $\{X_n\}$, with state space $S = \{1, 2, 3\}$, and tpm		+
4.	Consider a DTMC $\{X_n\}$, with state space $S = \{1, 2, 5\}$, and spin $P = \begin{pmatrix} 0 & 1/3 & 2/3 \\ 1/4 & 3/4 & 0 \\ 2/5 & 3/5 & 0 \end{pmatrix}$	(a) $\frac{1}{16} = 0.0625$ (b) $\frac{1}{4} = 0.25$	
	and initial distribution $P(X_0 = 1) = 2/5$, $P(X_0 = 2) = 1/5$ and $P(X_0 = 3) = 2/5$. Compute (a) $P(X_1 = 2, X_2 = 2, X_3 = 1 X_0 = 1)$; (b) $P(X_3 = 1 X_2 = 2, X_1 = 2, X_0 = 1)$; (c) $P(X_1 = 3, X_2 = 2, X_1 = 2, X_2 = 2)$	(c) 1/25 = 0.04 (d) persod=1	
5.	$2, X_3 = 1$); (d) period of state 1 A state i of the Markov chain of state space S, is called transient	(d) Person Jie, aperiodic	\
6.	if the probability of ever returning to state i i.e. f_{ii}^* is The true $\begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}$ is regular? (Yes/No)	No	
7.	John is in jail and has 2 dollars; he can get out on bail if he has 8	1 40	'
	dollars. A guard agrees to make a series of bets with him. If John bets A dollars, he wins A dollars with probability 0.6 and loses A dollars with probability 0.4. Find the probability that he wins 8	@ 0.5781	(
	dollars before losing all of his money if (a) he bets 1 dollar each time (timid strategy).	6 0136	1
	(b) he bets, each time, as much as possible but not more than necessary to bring his fortune up to 8 dollars (bold strategy).	(c) timid	1
	(c) Which strategy gives Smith the better chance of getting out of jail?(timid/bold)	المالية المالية	

Stochastic Proceso/stochastic Procentsinucha (MA 41017 / MA60067) P22 = 0 TT = \frac{1}{3} Since dously stochashic tpm inefreit le Only (a)



$$\frac{1}{2} (a) p(x_1 = 2, x_2 = 2, x_3 = 1) \times (a) p(x_1 = 2, x_2 = 2, x_3 = 1) \times (a) p(x_2 = 2) \times (a)$$

(a)
$$P(X_1 = 2, X_2 = 2, X_3 = 1 | X_5 = 1)$$

= $P(X_1 = 2 | X_5 = 1) \cdot P(X_2 = 2 | X_1 = 2)$

 $= P(X_1 = 2 \mid X_0 = 1) \cdot P(X_2 = 2 \mid X_1 = 2)$

$$= P(X_3 = 1 | X_2 = 2)$$

$$= \frac{2}{5} = 0.4$$
(c) $P(X_1 = 3, X_2 = 2, Y_3 = 1)$

$$= P(X_1 = 2) \cdot P(X_2 = 2 | X_1 = 2)$$

(b) $P(X_3=1|X_2=2,X_1=2,X_0=1)$

$$P(x_{3}=1) \times_{2}=2$$

$$= \sum_{k=1}^{3} P(x_{0}=k) \cdot P(x_{1}=3) \times_{2}=2$$

$$= \sum_{k=1}^{3} P(x_{0}=k) \cdot P(x_{1}=3) \times_{2}=2$$

$$F = \begin{cases} P(x_2 = 2 \mid x_1 = 3) \cdot P(x_3 = 1 \mid x_2 = 2) \\ - \left[\frac{2}{5} \right] \cdot \left[\frac{2}{3} \right] \cdot \left[\frac{2}{3} \right] \times \frac{2}{5} \times \frac{2}{5} \end{cases}$$

$$= \begin{bmatrix} \frac{2}{5} & \frac{1}{5} & \frac{2}{5} \end{bmatrix} \cdot \begin{bmatrix} \frac{2}{3} & \frac{2}{3} \\ 0 & \frac{2}{5} \end{bmatrix} \times \underbrace{\frac{2}{5}} = 0.08$$

(5)
$$f_{i,i} = 1$$

(6) $p^2 = \begin{pmatrix} 0 & 1 \\ -\frac{1}{2} & \frac{1}{2} \end{pmatrix} \cdot \begin{pmatrix} 0 & 1 \\ -\frac{1}{2} & \frac{1}{2} \end{pmatrix} = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} \\ -\frac{1}{4} & \frac{3}{4} \end{pmatrix}$

Yes, typin is regular.

(7) $p = 0.7$, $p = 0.3$
 $p = 0.7$, $p = 0.3$
 $p = 0.7$, $p = 0.3$
 $p = 0.7$

(d) period of state 1

Mambler's owin problem

=gcd / n: P(1)>0}

= gcd{2,3,4,...}

$$= 0.9223$$

$$= 0.9223$$
(b)

Probability of where absorption in state 8, starting from state 1, i=1,2,...,7

$$u_3 = p.u_6$$

$$u_4 = p$$

$$u_3 = p(p+2p)$$

If $p = 0.7 \implies u_3 = 0.7(0.7 + 0.7 \times 0.8) = 0.637$

 $1-\left(\frac{2}{P}\right)$

U6 = p+ 2. U4

(C) timid.

 $\frac{1 - \left(\frac{3}{7}\right)^3}{1 - \left(\frac{3}{7}\right)^7} = \frac{0.9213}{0.9989}$