**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG513 Probabilistic Models**

**HOMEWORK 6 Spring 2017-18**

1. Show that for any closed Markov chain , where *m* is the number of states. Is it true for n-transition probability matrix of this Markov chain.
2. Consider the following transition matrix:

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|  | 1. Which states are transient? 2. Which states are recurrent? 3. Identify all closed sets of states? 4. For which *n,* is positive value? 5. Is it possible that ? Why? |

1. A Markov chain with state 0,1,2 has the transition probability matrix



If . Find *E[X3]* .

1. Suppose that coin 1 has probability 0.4 of coming up heads and coin 2 has probability 0.7 of coming up heads. If the coin flipped today comes up heads, then we select coin1 to flip tomorrow and if it comes up tails, then, we select coin 2 to flip tomorrow. If the coin initially flipped is equally likely to be coin 1 or coin 2, then what is the probability that the coin flipped on the third day after the initial flip is coin1? Suppose that the coin flipped on Monday comes up heads. What is the probability that the coin flipped on Friday of the same week also comes up heads?
2. Specify the classes of the following Markov chains, and determine whether they are transient or recurrent.

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1. Show that if state *i* in a Markov chain is recurrent and *i* dose not communicate with state *j* then, *pij=0*.
2. Let *Xn* be a Markov chain with state space *{0,1,2}*, the initial probability vector and transition probability matrix 
3. Compute.
4. Compute.
5. Compute.
6. Compute 
7. A housewife buys three kinds of cereals (beans): A, B and C. She nevre buys the same cereal in successive weeks. If she buys cereal A, then the next week she buys B. However, if she buys either B or C, then the next week she is three times as likely to buy A as the other brands. In the long run, how often dose she buy each of the three brands?
8. A Toyota dealer consumes four kinds of engine oil A, B, C and D. This dealer buys its consumption each week. The dealer never buys the same brand in successive weeks, except brand D. If the dealer buys engine oil D then with same probability it can buy all kinds of engine oils next week. If the dealer perches brand C then next week it will buy D. However, if the dealer buys engine oil B then the next week it is three times as likely to perches A as the other brands and finally if the dealer buy engine oil A it will buy D or C with same probabilities. What is the probability that mentioned dealer buys oil C when we know that oil B was purchased three weeks ago?