**IME625: Introduction to Stochastic Processes**
**Quiz-2 Part-2, February 14, 2022**

**Duration: 5:45 to 6:00 pm** **Maximum marks: 5**

Instructions: *Write your answer on white paper, take its photo at the end of this part of the exam (6:00 pm), create a pdf and submit it via mookit, which would accept submissions till 6:10 pm. In case you have difficulty accessing mookit, you shall email or whatsapp me the pdf. Don't use multiple channels for answer submission. Answers received after 6:10 pm will attract heavy penalty, and those received after 6:15 pm will not be considered for grading. Hand-written answers on digital writing pad will be accepted*.

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2. Consider the question of survival of family name. Assume that every couple in a particular family gives birth to 0, 1, or 2 male children with probabilities 0.1, 0.4, and 0.5 respectively. Note that only male children carry the family name forward. There is only 60% chance that a male child survives to reach the adulthood and reproduce (as above). If the family started with one couple, obtain the probability of survival of the family name in the long run. First, model the situation as a branching chain. [Marks: 1+1.5]

Assume that the external environment (medical science, diplomacy, etc.) was going through a transition when the first couple was establishing the family name. As a result, the chances of survival of a male child improved to 80% for the next generation and afterwards. Note that the children of the first couple (*if any*) had 60% survival probability, but their grandchildren and subsequent generations (*if any*) had 80% survival probability. With this change, obtain the probability of survival of the family name in the long run. [Marks: 2.5]

*Note*: You can use the results obtained in the last class, which is not included in the quiz.