B.Sc. (Honours) Examination, 2021
Semester-V
Statistics
Course: CC-11B
(Practical on Stochastic Process and Queuing Theory)
Time: 2 Hours   Full Marks: 20

Questions are of value as indicated in the margin
Notations have their usual meanings

Answer **all** questions

1. The transition probability matrix of a Markov chain $\{X_n, \ n = 1, 2, \cdots\}$ having three states $1, 2$ and 3 is $P = \begin{pmatrix} 0.2 & 0.5 & 0.3 \\ 0.3 & 0.4 & 0.3 \\ 0.1 & 0.5 & 0.4 \end{pmatrix}$ and the initial distribution is $\Pi_0 = (0.3, 0.5, 0.2)$.
   Find $P(X_1 = 2), \ P(X_3 = 2, X_2 = 3, X_1 = 1, X_0 = 1)$.   5

2. Let $\{X_n, n \geq 0\}$ be a Markov chain having state space $S = \{1, 2, 3, 4\}$ with transition probability matrix $P = \begin{pmatrix} \frac{1}{3} & \frac{2}{3} & 0 & 0 \\ 1 & 0 & 0 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{2} & \frac{1}{2} \end{pmatrix}$. In usual notations, find $f_{11}^{(2)}, f_{22}^{(3)}, f_{13}^{(2)}, f_{42}^{(3)}$.   10

3. Customers arriving at a mobile shop according to a Poisson process with mean rate of 3 per minute. Find the probability that in an interval of 7 minutes, the number of customers arriving the shop is greater than 6.   5