Department of Mathematics

Probability and Random Processes **15B11MA301**

Tutorial Sheet 14 **B.Tech. Core**

Poisson Random Process

Q.1: Define a Poisson process with suitable example. State and prove all the properties of Poisson process.

Q.2: The particles are emitted from a radioactive source at the rate of 40 per hour. Find the probability that exactly 6 particles are emitted during a 25 minutes period.

(Ans. 0.00171996)

Q.3: Customers arrive at the complaint department of a store at the rate of 5 per hour for male customers and 10 per hour for female customers. If arrivals in each case follow Poisson process, calculate the probabilities that

(a) at most 4 male customers, (Ans. $e^{-5t}[1 + 5t + \left(\frac{25}{2}\right)t^2 + \left(\frac{125}{6}\right)t^3 + \left(\frac{625}{24}\right)t^4]$)

(b) at most 4 female customers will arrive in a 30-minute period (Ans. 0.4405)

(c) the inter arrival time for male candidates exceeds 15 minutes. (Ans.$e^{-\left(\frac{5}{4}\right)}$)

Q.4: If customers arrive at a service counter in accordance with a Poisson process with a mean rate of 5 per minute, find the probability that the interval between 2 successive arrivals is

(i) more than 3 minutes (Ans.$e^{-(15)}$)

(ii) between 4 to 7 minutes (Ans. 0.2×10^{-8}))

(iii) less than 6 minutes. (Ans. $1 - e^{-30}$)

Q.5: The number of accidents in a city follows a Poisson process with a mean of 2 per day and the number X_i of people involved in the i^{th} accident has the distribution (independent) $P\{X_i = k\} = \frac{1}{2^k}$ $(k \geq 1)$. Find the mean and variance of the number of people involved in accidents per week. (Ans. Mean= 28, Variance =56)