Name:

Enrolment No:

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Course: Statistical Modeling for computer Science **Course Code: CSEG7003**

Semester: I

Programme: M.Tech CSE

Time: 03 hrs. **Max. Marks: 100**

S. No.		Marks	CO
	SECTION A		
Q 1	What is the difference between pmf and cdf?	**4**	**CO2**
Q 2	In a sample of 25 observation from a normal distribution with mean 98.6 and standard deviation 17.2, what is P(92< $\acute{x}$ <102)?	**4**	**CO1**
Q 3	A certain firm has plants A, B, and C producing respectively 35%, 15%, and 50% of the total output. The probability of non defective product are, respectively 0.75, 0.95, and 0.85. A customer receive a defective product. What is the probability that it came from plant C?	**4**	**CO1**
Q 4	Explain different types of stochastic process.	**4**	**CO4**
Q 5	Prove that sample mean is an unbiased estimator of population mean.	**4**	**CO3**
	SECTION B		
Q 6	Prove that superposition and decomposition of Poisson process will also result in Poisson process.	**10**	**CO4**
Q 7	State the conditions when Poisson pmf can be used as a convenient approximation to the binomial pmf and derive this approximation.	**10**	**CO2**
Q 8	Lifetimes of IC chips manufactured by a semiconductor manufacture are approximately normally distributed with mean= 5*10^6 and std. deviation =5*10^5 hours. A mainframe manufacturer require that at least 95 percent of a batch should have a lifetime greater that 4*10^6 hours. Will the deal be made?	**10**	**CO2**
Q 9	Explain birth death process for discrete parameter homogeneous Markov chain. OR Show that the time that a discrete- parameter homogeneous Markov chain spends in a given state has a geometric distribution.	**10**	**CO4**
	SECTION-C		
Q 10	a) For joint probability density function: $f(x,y)=\left\{\begin{matrix} \frac{21}{4}x^2\, y\, if\; x^2 \le y<1 \\ 0\, otherwise \end{matrix}\right\}$ (i) Find marginal pdf of x and y.	**10+10**	**CO2**

	(ii) Are x and y independent? b) What is markov or memoryless property of geometric distribution? Prove it with an example.		
Q 11	Why Chi-Square test is used? Suppose the number of boys in 500 families with 5 children is investigated. There were 20 families with no boy, 75 with 1, 145 with 2, 140 with 3, 85 with 4, and 35 with 5 boys. Decide (with level of significance α = 0.05) whether the number of boys in a 5-children family follows binomial distribution. OR Cost accountants often estimate overhead based on the level of production. They have collected information on the overhead expense and units of produced at the different plants and want to estimate a regression to predict future overhead. **Overhead:** 191 170 272 155 280 173 234 116 153 178 **Units:** 40 42 53 35 56 39 48 30 37 40 **a)** Develop the regression equation for cost accountants. **b)** Predict overhead when 50 units are produced. **c)** Calculate the standard error of estimate. **d)** Find out the correlation coefficient for above two variables.	**20**	**CO3**

Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Course: Statistical Modeling for computer Science **Course Code: CSEG7003**

Semester: I

Programme: M.Tech CSE

Time: 03 hrs. **Max. Marks: 100**

SECTION A

S. No.		**Marks**	**CO**
Q 1	In a party of 5 persons, compute the probability that at least two have the same birthday, assuming a 365-day year.	**4**	**CO1**
Q 2	Prove that sample mean is an unbiased estimator of population mean.	**4**	**CO3**
Q 3	If X and Y are independent, prove Var[X+Y] = var[X] + Var[Y].	**4**	**CO2**
Q 4	A box with 15 IC chips contains 5 defectives. If random sample 3 chips is drawn, what is the probability that all three are defective.	**4**	**CO1**
Q 5	Explain birth death process for discrete parameter homogeneous Markov chain.	**4**	**CO4**

SECTION B

Q 6	A series of n jobs arrives at a computing center with n processors. Assume that each of the n^n possible assignment vectors are equally likely. Find the probability that exactly one processor will be idle.	**10**	**CO1**
Q 7	What is Stochastic Process? Explain the different types and classification of Stochastic Process.	**10**	**CO4**
Q 8	What are open and close queuing networks? Explain using a suitable example. OR Explain the following term with respect to discrete parameter Markov chain: i) Transient State ii) Recurrent State iii) Irreducible Markov chain	**10**	**CO4**
Q 9	In manufacturing a certain component, two types of defects are likely to occur with respective probabilities 0.05 and 0.1. What is the probability that a randomly chosen component: i) Does not have either kind of defect? ii) Is defective? iii) Has only one kind of defects, given that it is found to be defective?	**10**	**CO2**

SECTION-C			
Q 10	i)What is Markov or memoryless property of geometric distribution? Illustrate it with an example. ii) What is uniform distribution? Write its distribution function. Let continuous random variable X be uniformly distributed on (0, 1) and $Y= - (1/\lambda)\ln(1-X)$. Show that Y has exponential distribution with parameter λ.	**10+10**	**CO2**
Q 11	Why Chi-Square test is used? At the .10 level of significance, can we conclude that the following 400 observation follow a Poisson distribution with **λ=3?** <table><tr><td>No of arrivals per hours</td><td>0</td><td>1</td><td>**2**</td><td>**3**</td><td>**4**</td><td>**5 or more**</td></tr><tr><td>No of hours</td><td>20</td><td>57</td><td>98</td><td>85</td><td>78</td><td>62</td></tr></table> OR Two independent samples of observations were collected. For the first sample of 60 elements the mean was 86 and the standard deviation 6. The second sample of 75 elements had a mean of 82 and standard deviation of 9. a) Compute the estimated standard error of the difference between two means. b) Using alpha=0.01, test whether the two samples can reasonably be considered to have come from population with the same mean. c) Prove that $var(aX+b)=a^2 var(X)$.Where X is a random variable. d) Suppose random variable X has Geometric distribution, find out E[X].	**20**	**CO3**