Roll No: --------------------------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: M. Tech. CSE (AI & NN) | **Semester – I**
Subject (Course): Statistical Modelling for Computer Sciences | **Max. Marks : 100**
Course Code : CSEG7003 | **Duration : 3 Hrs**
No. of page/s: 1

	Section A (Attempt all questions)	
1.	A communication channel receives independent pulses at the rate of 12 pulses per microsecond. The probability of transmission of error is .001 for each pulse. Compute the probability of: (i) No error per microsecond (ii) At least one error per microsecond	**[4]**
2.	Explain the significance of regression analysis.	**[4]**
3.	Prove the linearity property of expectation.	**[4]**
4.	Prove that decomposition of Poisson process will result in independent Poisson sub processes.	**[4]**
5.	Discuss the state classification of discrete parameter homogeneous Markov chain.	**[4]**
	Section B (Attempt all questions)	
6.	A lot of transistor contains .6% defectives. Each transistor is subjected to a test that correctly identifies a defective, also misidentifies defective about 2 in every 100 good transistor. Given that a randomly chosen transistor is good by the tester, compute the probability that it is actually good.	**[8]**
7.	Prove that sample variance is an unbiased estimator of population variance.	**[8]**
8.	Using generating function transformation, calculate the expectation and variance of random variable whose distribution is according to geometric distribution.	**[8]**
9.	Explain the three generalization of Bernoulli process.	**[8]**
10.	Explain birth death process for discrete parameter homogeneous Markov chain.	**[8]**
	Section C (Attempt two questions, Do one from 12^{th} and 13^{th})	
11.(a)	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]**
11.(b)	Explain the steps of chi square test of independence.	**[10]**
12.(a)	If X & Y are independent random variables then prove that Var[X+Y] = Var[X] + Var[Y]	**[10]**
12.(b)	Explain the classification of Stochastic process.	**[10]**
	OR	
13.(a)	Using suitable example, explain open and close queuing network.	**[10]**
13.(b)	Prove that uni-programmed computer system with m I/O devices and a CPU can be represented by finite irreducible Markov chain. Also calculate the limiting state probability vector for the same.	**[10]**

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Section A (Attempt all questions)		
1.	Explain the Bernoulli and generalized Bernoulli trial with the help of suitable example.	**[4]**
2.	Explain the significance of Confidence interval and level of significance.	**[4]**
3.	If X & Y are independent random variable then prove that E[XY]=E[X]E[Y]	**[4]**
4.	Prove that superposition of 'n' independent Poisson process will also be a Poisson process.	**[4]**
5.	Prove that distribution of time between state changes is according to geometric distribution.	**[4]**
Section B (Attempt all questions)		
6.	There are two identical pots containing respectively 4 white and 3 red balls and 3 white and 7 red balls. A pot is chosen at random and a ball is drawn from it. Find the probability that ball is white. If the ball is white, what is the probability that it is from the first pot.	**[8]**
7.	Prove that sample mean is an unbiased estimator of population mean. Also derive the relationship between sample variance and population variance.	**[8]**
8.	Using Laplace transformation, calculate the expectation and variance of random variable whose distribution is according to exponential distribution.	**[8]**
9.	What is stochastic process? Explain the different types of stochastic process.	**[8]**
10.	How can we derive n step transition probability from the given one step transition probability?	**[8]**
Section C (Attempt two questions, Do any one from 12^{th} and 13^{th})		
11.(a)	Derive an expression for inclusion exclusion principle.	**[10]**
11.(b)	Explain steps of Kolmogorov Smrinov test for uniformity.	**[10]**
12.(a)	Let X be uniformly distributed on (0, 1) and Y= - (1/λ)ln(1-X). Show that Y has exponential distribution with parameter λ	**[10]**
12.(b)	Prove that random telegraph process is wide sense stationary process.	**[10]**
OR		
13.(a)	Derive an expression for average number of jobs found in server in M/M/1 queuing network.	**[10]**
13.(b)	Explain open and close queuing network.	**[10]**