Reg. No. :

Question Paper Code: 12021

M.E. DEGREE EXAMINATION, MAY 2014.

First Semester

Communication Systems

01PMA122 - APPLIED MATHEMATICS FOR COMMUNICATION ENGINEERS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Prove that
2. Show that −
3. Explain Least-squares method.
4. State any two application of Toeplitz matrix.
5. Define moment generating function if is continuous and state any two properties.
6. Define gamma distribution.
7. State Karl Pearson's coefficient of correlation.
8. Find the value of for the probability density function .
9. Derive mean of Poisson process and define autocorrelation of the Poisson process.
10. Derive expected number of customers waiting in the queue for single server infinite capacity model.

PART - B (5 x 16 = 80 Marks)

11. (a) Prove the following for Bessels's functions:

(i) — – (8)

(ii) State and prove orthogonal property for Bessel's function. (8)

Or

(b) (i) State and prove generating function for Bessel's function. (8)

(ii) Express in terms of and (8)

12. (a) (i) Find Least-square solution of the inconsistent system for

, (8)

(ii) Find QR decomposition for the matrix

(8)

Or

(b) Find single value decomposition of (16)

13. (a) (i) Derive MGF of binomial distribution and derive its mean and variance using MGF. (8)

(ii) Derive MGF of normal distribution and derive its mean and variance using MGF. (8)

Or

(b) (i) Derive MGF of Poisson distribution. If is a Poisson variate such that find the variance. (8)

(ii) A random variable has the following distribution:

X:	-2	-1	0	1	2	3
P(x):	0.1	k	0.2	2k	0.3	3k

Find the value of cumulative distribution of (8)

14. (a) (i) The joint probability mass function is

Find marginal and conditional probability distributions. (8)

(ii) The joint probability density function

—

Find – – (8)

Or

(b) (i) Obtain the correlation coefficient for the joint probability density function

(10)

(ii) If

Find the value of . (6)

15. (a) (i) Prove that difference of two independent Poisson process is not a Poisson process (4)

(ii) Prove that the interval between 2 successive occurrences of a Poisson process with parameter has an exponential distribution with mean –.. (6)

(iii) Suppose customers arrive at a bank to a Poisson process with Find the probability that during a time interval of 2 minutes, exactly 4 customers arrive, greater than 4 customers arrive. (6)

Or

(b) (i) Derive the value of and for [M/M/1]:[K/FCKS] model. (8)

(ii) Arrivals at a telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The duration of the phone calls is assumed to be exponentially distributed with mean 3 minutes. What is the probability that a person at a booth will have to wait and find average number of units in the system and also find probability that it will take more than 10 minutes to wait for phone and complete the call. (8)