Printed Pages : 2 **Roll No.** | | | | | | | | | | | **MEC-202**

M.TECH. (SEM–II)

CARRY OVER EXAMINATION 2016-17

PROBABILITY, STATISTICS & QUEUING MODEL

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

1. Attempt any Four parts of the following: **4 × 5 = 20**

(a) With suitable diagram prove that if A is subset of B then P (A) ≤ P (B)?

(b) What is Priority Queuing? Explain with suitable example?

(c) Define the term Random Function? Find the constant C so that the function

$$f(x) = \begin{cases} C(x-1), & 1 < x < 4 \\ 0, & \text{Otherwise} \end{cases}$$

is a density function?

(d) What is Gaussian process? Write down the properties of Gaussian process?

(e) Prove that Variance Var(X)= $\sigma_X^2 = E(X^2) - \mu^2$

(f) What is maximum likelihood method for parameter estimation?

2. Attempt any Four parts of the following: **4 × 5 = 20**

(a) Explain the basic features and application of Queuing theory?

(b) If a random variable has the probability density

$$f(x) = \begin{cases} 2e^{-2x} \text{ for } x > 0 \\ 0 \text{ for } x \le 0 \end{cases}$$

Find the probability that it will take on a value (i) Between 1 & 3 (ii) Find the mean and variance of the probability density function f(x)?

(c) With suitable block diagram explain detection and estimation of signal in a communication system?

(d) Prove that the steady state output of an M/M/r queue with Poisson input parameter λ is also Poisson with parameter λ?

(e) A random variable has an exponential PDF given by $f(x) = e^{-b|x|}$ where a & b are constants. Find (i) The relationship between a & b? (ii) The distribution functions of x?

(f) What is Bayes' theorem? A town has a population of 10000 people out of which 6000 are males and 4000 are females. Also 300 males and 400 females of this population are unemployed. An unemployed person is chosen at random. What is the probability that he is a male?

P.T.O.

3. Attempt any Two parts of the following: 2 × 10 = 20

(a) What is the significance of Erlang's model? Explain Erlang's loss formula?

(b) Explain Central Limit Theorem? An insurance company has 25000 automobile policy holders. If the yearly claim of a policy holder is a random variable with mean 320 and standard deviation 540, approximate the probability that the yearly claim exceeds 8.3 million?

(c) With suitable derivation differentiate between minimum MSE (MMSE) estimation and maximum a posteriori (MAP) estimation?

4. Attempt any Two parts of the following: 2 × 10 = 20

(a) What is estimation of signal? Explain Maximum a Posteriori Estimate?

(b) What are the parameters required for complete characterization of the queuing system?

(c) Distinguish between detection and estimation? Explain how is the phase of a received waveform estimated by applying maximum likelihood estimation principle?

5. Attempt any Two parts of the following: 2 × 10 = 20

(a) What is Ergodicity? Explain transmission of random process through a linear filter?

(b) **Write short note on**

(i) Cross Power Spectral Density

(ii) White Gaussian Noise

(c) What receiver will yield the minimum error probability? With suitable signal space diagram explain the principle of operation of Optimum receiver?