Student Exam No.________________

GANPAT UNIVERSITY

B. Tech. Semester: VI (EC) Engineering

Regular Examination April – June 2016

2EC604: Introduction to Detection Theory

Time: 3 Hours **Total Marks: 70**

Instruction:

1.Attempt all questions.
2.Answers to the two sections must be written in separate answer books.
3.Figures to the right indicate full marks.
4.Assume suitable data, if necessary.

SECTION - I

1 (A) From a lot containing 25 items, 5 of which are defective, 4 items are selected at random. If X is no. of defective found, obtain the probability distribution of X. each items are selected (1) without replacement (2) with replacement 6

(B) An urn contains 10 white and 3 black balls. Another urn contains 3 white and 5 black balls. Two balls are drawn at random from the first urn and placed in the second urn and then 1 ball is taken at random from the latter. What is the probability that it is white ball? 4

(C) Prove the probability of the impossible event is zero. 2

OR

1 (A) A random variable X has the following Probability distribution 6

X	0	1	2	3	4	5	6	7
P(X)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

(a) Find K.
(b) Evaluate $P(1.5 < X < 4.5 / X>2)$
(c) find the smallest value of λ for which $P(X \leq \lambda) > 0.5$

(B) A box contains 4 bad and 6 good tubes. Two are drawn out from the box at a time. One of them is tested and found to be good. What is the probability that the other is also good? 4

(C) If P(A)=P(B)=P(AB), show that $P(A\bar{B} + \bar{A}B) = 0$ 2

2 (A) If the density function of a continuous Random Variable X is given by 5

$$f(x) = \begin{cases} \partial x\,; & 0 \leq x \leq 1 \\ \partial\,; & 1 \leq x \leq 2 \\ 3\partial - \partial\,; & 2 \leq x \leq 3 \\ 0\,; & elsewhere \end{cases}$$

Find (1) value of a (2) CDF of X.

(B) State the Discrete Binomial distribution and find mean and variance of this distribution 6

OR

2 (A) State the continuous normal distribution and find mean and variance of this distribution 6

(B) Define moments, means and nth central moment with their equation. 5

3 (A) Disuses the Bernoulli's trials and state and prove Bernoulli's theorem. 4

(B) One integer is chosen at random from the number 1, 2, 3, ... ,100. What is the probability the chose number is divided by (i) 6 or 8 and (ii) 6 or 8 or both? 4

(C) What is inequality in random variable? State and prove the Tchebycheff Inequlity.

SECTION – II

4 (A) Three balls are drawn at random without replacement from a box containing 2 white, 3 red and 4 black balls. If x denotes the numbers of white balls drawn and y denotes the number of red balls drawn, find the joint probability distribution of (x, y). 4

(B) Explain correlation coefficient and derive equation for r_{xy}. 5

(C) Define the autocorrelation of random process $\{X(t)\}$ and $R(\tau)$ is even function of τ 3

OR

4 (A) Discuss the cumulative distribution function for two dimensional random variable and write their properties. 4

(B) The input to a binary communication systems, denoted by a random variable X, takes on e of two values 0 or 1 with probability ¾ and ¼ respectively because of noise in the systems the output y differs from the input occasionally. The conditional probability given $P\left(y=1 / x=1\right)=\frac{3}{4}$ and $P\left(y=0 / x=0\right)=\frac{7}{8}$ 6

Find (1) P(y=1) (2) P(y=0) (3) $P\left(y=1 / x=1\right)$.

(C) Write down the necessary condition for strict sense stationary process. 2

5 (A) Explain detection of signals with Gaussian noise using correlation receiver. 6

(B) Write a short note on demodulation and detection of digital signals. 5

OR

5 (A) Explain error performance degradation in communication system in brief. 6

(B) Explain noncoherent detection of FSK. 5

6 (A) Explain Matched filter for detection of binary signals in Gaussian noise. 6

(B) Explain vectorial view of signals and noise in brief. 6

END OF PAPER