

SALMA BINT ABDULRAHIM.

C1204/103858/20

SMS 3450

1452

ASSIGNMENT.

1.) Let  $e = 0011011101$  with  $n=10$ ,  $k=3$ . Perform Serial test.

Solution:

$e = 0011011101$

$n = 10$

$k = 3$

Determine the possible  $k$ -bits patterns.

$\overset{1}{0}\overset{2}{0}\overset{3}{1}\overset{4}{1}\overset{5}{0}\overset{6}{1}\overset{7}{1}\overset{8}{1}\overset{9}{0}\overset{10}{1}$

001, 011, 110, 101, 011, 111, 110, 101

Occurrence

001

011

110

101

011

111

110

101

$f$

0

1

0

2

0

2

2

1

$f^2$

0

1

0

4

0

4

4

1

$\Sigma f^2 = 14$

Compute statistics.

$$\Rightarrow S_k^2 = \frac{2^k}{n} \Sigma f^2 - n$$

$n = 10$

$2^k = 8$

$\Sigma f^2 = 14$

$$S = \frac{8}{10}(14) - 10$$

$$S = 11.2 - 10$$

$$\underline{S = 1.2}$$

$$\Rightarrow S_{k-1}^2 = \frac{2^{k-1}}{n} \sum f^2 - n$$

$$S = \frac{2^{3-1}}{10}(14) - 10$$

$$S = \left(\frac{4}{10} \times 14\right) - 10$$

$$S = 5.6 - 10$$

$$\underline{S = -4.4}$$

$$\Rightarrow S_{k-2}^2 = \frac{2^{k-2}}{n} \sum f^2 - n$$

$$S = \left(\frac{2^{3-2}}{10} \times 14\right) - 10$$

$$S = 2.8 - 10$$

$$\underline{S = -7.2}$$

$$\Rightarrow S_{k-3}^2 = \frac{2^{k-3}}{n} \sum f^2 - n$$

$$S = \frac{2^0}{10} \times 14 - 10$$

$$S = 1.4 - 10$$

$$\underline{S = -8.6}$$

Compute Differences

$$\begin{aligned} \Delta S_k^2 &= S_k^2 - S_{k-1}^2 \\ &= 1.2 - (-4.4) \\ &= \underline{5.6} \end{aligned}$$

$$\begin{aligned} \Delta^2 S_k^2 &= S_k^2 - (S_{k-1}^2 + S_{k-2}^2) \\ &= 1.2 - (-4.4 + -7.2) \\ &= \underline{12.8} \end{aligned}$$

Compute the P value

$$\begin{aligned} P\text{-value} &= (-7.2, 5.6/2) \\ &= \underline{(-7.2, 2.8)} \end{aligned}$$

$$\begin{aligned} P\text{-value} &= (-8.6, 12.8/2) \\ &= \underline{(-8.6, 6.4)} \end{aligned}$$



2. Use the rejection method to generate random variate with probability density function.

$$f(x) = 2x, 0 \leq x \leq 1$$

Solution.

$$f(x) = \int_0^x 2t dt = x^2, 0 \leq x \leq 1$$

$$cf(x) = \leq 1$$

$$f(x) = x^2, x=1, c=1$$

$$f(x) = x^2$$

$$x = \sqrt{r} \quad \text{random number} \rightarrow r, u(0,1)$$

$$r_1, r_2 \text{ from } u(0,1)$$

$$r_2 \leq cf(x) = 2x$$

$$E(x) = \frac{2}{3} = 0.6667$$

$$\text{Var}(x) = \frac{1}{18} = 0.0556$$

$$\text{Since } c=1 = r_2 \leq 2\sqrt{r_1}$$

If the condition holds, accept  $x = \sqrt{r_1}$   
Otherwise reject and repeat.