# BACHELOR OF ARTS EXAMINATION, 2017

( 1st Year, 2nd Semester )

## ECONOMICS (HONOURS)

## STATISTICS II (OLD)

Time : Two hours                                                                 Full Marks : 30

### Answer any three from the following four questions.

1. (a) The chances that doctor C will diagnose disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chances of death by wrong diagnosis is 70%. A patient of doctor C, who had disease X died. What is the chance that his disease was diagnosed correctly.

    (b) The following categorized data gives the classification of     people according to their intelligence and mood upon getting up in the morning.

| Mood | Intelligence | | |
|---|---|---|---|
| | Intelligent | Average | Below average |
| Good | 10 | 8 | 5 |
| Tolerable | 8 | 9 | 10 |
| Intolerable | 5 | 6 | 14 |

Test whether there is any evidence of association between these characteristics.           5+5

2. (a) Obtain the MGF of a discrete uniform distribution.

    (b) From the following MGF find mean and variance of the distribution

$M(t) = (1 - 3t)^{-4}$                                                                 [ Turn over

(c) The probability that a certain type of light bulb will burn out in less than 400 hours is 0.5, the probability that it will burn out in less than 700 but more than 400 hours is 0.3, and the probability that it will last more than 700 hours is 0.2. Find the probability that among 10 such light bulbs, 4 will burn out in less than 400 hours, 4 will burn out in less than 700 but more than 400 hours, while 2 will last more than 700 hours.                3+3+ 4

3.   (a) Evaluate the covariance between x and y if the joint probability distribution is as follows:

| X<br>Y | 0 | 2 |
|---|---|---|
| 0 | 1/4 | 1/4 |
| 1 | 1/4 | 1/4 |

(b) $X_1, X_2 ... X_n$ are independent observations from a Normal distribution with both mean and variance equal to an unknown parameter $\theta > 0$ i.e. the probability density of $X_i$ is

$$f(x_i, \theta) = \frac{1}{\sqrt{\theta 2\pi}} e^{-\frac{(x_i - \theta)^2}{2\theta}}$$

What is the MLE of $\theta$?                4+6

4.   (a) Suppose x is a continuous random variable following Normal distribution with mean $\mu$ and variance $\sigma^2$. Evaluate the probability $P\{X - 2\sigma < \mu < X + 3\sigma\}$.

(b) Suppose that babies' weights at birth are normally distributed with a mean of 7 pounds and a variance of 1 pound. A particular obstetrician is suspected of giving pregnant women poor advice on diet, which would cause babies to be 1 pound lighter on average (but still have the same variance). You observe the weight of 10 babies that he delivers. The mean weight of the 10 babies is 6.2 pounds. Test the null hypothesis that the obstetrician is not giving poor advice against the alternative hypothesis that he is at 5 % level of significance.

(c) Define and explain consistency property of a good estimator.                3+4+3