Mansoura University **Faculty of Engineering** **Math. & Eng. Phy. Dept.** **Academic Year: 2018 / 2019** **Summer Semester** **Tuesday 27 / 8 / 2019**		**Course title: Probability & Statistics** **Course code: MTH103** **Final Exam,** **BME Level 100 Students** **Total Mark: 50** **Time allowed: 2 hours**

Answer the following questions

1st Question [15 marks]

(a) The brightness of a television picture tube can be evaluated by measuring the amount current required to achieve a picture brightness level. A sample of **12** tubes results in $\bar{X} = 312.2$ and $S = 15.7$(micro amps). **Find** 99% confidence interval on mean current required. [5 marks]

(b) In measuring the mean height of the XYZ University students with standard deviation 7cm. **How large** a sample of measurements must be taken to be **95%** confident that the error of estimate will not exceed **2**cm? [5 marks]

(c) A city installs **2000** electric lamps for street lighting. These lamps have mean burning life of 1200 hours and standard deviation of **200** hours. The normal distribution is a close approximation to this case.

(i) **How many** lamps are expected to fail in the first **1000** burning hours?

(ii) **After how many** burning hours would we expect **10%** of the lamps to be left?

[5 marks]

2nd Question [10 marks]

(a) The time to failure of fans in a personal computer is a continuous random variable X which can be modeled by an exponential distribution with mean 500 hours.

(i) **What** is the probability that the fans will last at least 500 hours?

(ii) **What** is the probability that the fans will last at most 250 hours?

(iii) **Evaluate** the variance of the random variable X. [5 marks]

(b) The probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} x & 0 \le x \le 1 \\ k - x & 1 < x \le 2 \\ 0 & otherwise \end{cases}$$

(i) **Find** the value of the constant k.

(ii) **Evaluate** the distribution function of the random variable X.

(iii) **Compute** $P(-0.5 < x < 0.5)$. [5 marks]

3rd Question [15 marks]

(a) An electronic product contains **30** integrated circuits (**ICs**) that work independent. The mean number of defective **ICs** in the product is **3**. The product operates only if there is at most **3** defective **ICs**. **What** is the probability that the product operates? [5 marks]

(b) A box contains **2** red balls, **4** white balls and **6** blue balls. **6** balls are drawn randomly with replacement. **Find** the probability of obtaining:

(i) 2 balls of each color.
(ii) One white ball only in the last drawing. [5 marks]

(c) The number of typographical errors on a single page of a book has a **Poisson distribution** with average two errors per page. **Calculate** the probability that [5 marks]

(i) At least 2 errors on this page.

(ii) 2 errors on two pages.

(iii) One error in page number 20 and two errors in page number 40.

4th Question [10 marks]

(a) Two designers work independent, the probability that the first solve a problem is **0.5** and the second solve a problem is **0.7**. **What** is the probability that

(i) Both solve the problem?

(ii) At least one of them solve the problem?

(iii) The first designer only solve the problem? [5 marks]

(b) A telephone number is a 7 digit sequence, but the first digit has to be different from **0** or **1**. VIP number has equal last 4 digits. **How many** VIP telephone numbers? [5 marks]

Best wishes Dr. Ayman Gomaa