

UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCESDEPARTMENT OF PHARMACYFIRST BPHARM PART II EXAMINATION - JANUARY 2018PH 1262 BIOSTATISTICS I**TWO HOURS**INSTRUCTIONS

- There are four (04) questions in the SEQ paper.
- Answer **all** questions in the booklet provided.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Calculators are allowed

1.

- 1.1. Discuss general shapes of normal distributions. (10 marks)
- 1.2. State the empirical rule for data having a bell-shaped distribution. (30 marks)

1.3. Loss of calcium in the body is a serious problem for older women. To investigate the amount of loss, a researcher measured the initial amount of bone mineral content in the radius bone of the dominant hand of elderly women and then the amount remaining after one year. The differences, representing the loss of bone mineral content (mg/dL), are given in the following table.

8	7	13	3	6
4	8	6	3	4
0	1	11	7	1
8	6	12	13	10
9	11	3	2	9
7	1	16	3	2
10	15	2	5	8
17	8	2	5	5

- 1.3.1. Calculate sample mean (\bar{x}) and sample standard deviation (s). (20 marks)
- 1.3.2. Find the proportion of the observations that are in the intervals $\bar{x} \pm s$, $\bar{x} \pm 2s$, and $\bar{x} \pm 3s$. (20 marks)
- 1.3.3. Compare the results of part 1.3.2. with the empirical rule. (20 marks)

2.

2.1. A large teaching hospital and a base hospital are located in your area. The outcomes of the surgeries of the two hospitals are given below.

	Died	Survived	Total
Teaching Hospital	90	2110	2200
Base Hospital	23	677	700

where the outcome is “survived” if the patient lives at least six weeks.

- 2.1.1. Calculate the proportion of patients who have survived after surgery at each of the hospitals. (20 marks)
- 2.1.2. Which one of the two hospitals would you choose for a surgery? Justify your answer. (20 marks)

2.2. Medical case histories indicate that illnesses may produce identical symptoms. Suppose that a particular set of symptoms, denoted H , occurs only when any one of three illnesses, I_1, I_2 , or I_3 , occurs. Assume that the simultaneous occurrence of more than one of these illnesses is impossible and that $P(I_1) = 0.01$, $P(I_2) = 0.005$, and $P(I_3) = 0.02$.

The probabilities of developing the set of symptoms H , given each of these illnesses, are known to be $P(H | I_1) = 0.9$, $P(H | I_2) = 0.95$, and $P(H | I_3) = 0.75$

Assuming that an ill person exhibits the symptoms, H , what is the probability that the person has illness I_1 ?

(60 marks)

3.

3.1. Heart failure is due to either internal (87%) or external (13%) factors. External factors are related to substance induced or foreign objects. Internal occurrences are caused by arterial blockage, disease, and infection. Suppose that 20 patients have visited an emergency room with heart failure. Assume that causes of heart failure between individuals are independent.

- 3.1.1. What is the probability that three individuals have conditions caused by external factors?
- 3.1.2. What is the probability that three or more individuals have conditions caused by external factors?

3.1.3. What are the values of mean and standard deviation of the number of individuals with conditions caused by external factors?

(60 marks)

3.2. The number of people arriving for treatment at an emergency room can be modeled by a Poisson distribution with a rate parameter of five per hour.

3.2.1. What is the probability that exactly four arrivals occur during a particular hour?

3.2.2. What is the probability that at least four people arrive during a particular hour?

(40 marks)

4.

4.1. A research scientist reports that mice will live an average of 40 months when their diets are sharply restricted and were enriched with vitamins and proteins. Assuming that the lifetime of such mice is normally distributed with a standard deviation of 6.3 months, find the probability that a given mouse will live

4.1.1. more than 32 months;

4.1.2. less than 28 months;

4.1.3. between 37 and 49 months.

(60 marks)

4.2. If 20% of the trees in a forest are infested with a certain type of parasite, what is the probability that, in a random sample of 300 trees, the number of trees having the parasite will be inclusive between 49 and 71?

(40 marks)

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