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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	PROBABILITY AND STATISTICS I
COURSE CODE	:	BWB 10403
PROGRAMME CODE	:	BWA / BWQ
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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Q1 A researcher timed how long it took for each of volunteers to perform a simple task. The results are shown in the **Table Q1**.

Table Q1

Time (seconds)	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34
Number of Volunteers	2	12	5	17	2	3

(a) Find the total number of volunteers in the survey.

(2 marks)

(b) Construct a frequency table for the given data.

(7 marks)

(c) Use the values in your frequency table to compute the value for the average time of the volunteers.

(2 marks)

(d) Without drawing a cumulative frequency curve, estimate the median of times.

(3 marks)

(e) Evaluate the mode of times taken to complete the task.

(3 marks)

(f) Compute the standard deviation of the times taken to complete the task.

(4 marks)

(g) If another 50 volunteers take 1050 seconds to compete the task, find the mean time for all volunteers.

(4 marks)

Q2 (a) The manufacturing department of a company hires technicians who are college graduates as well as technicians who are not college graduates. Under their diversity program the manager of any given department is careful to hire both male and female technicians. The data in **Table Q2 (a)** show a classification of all technicians in a selected department by qualification and gender. Suppose that the manager promotes one of the technicians to the supervisory position.

Table Q2 (a): Classification of technicians by qualification and gender

Gender	Graduates	Non-graduates	Total
Male	20	36	56
Female	15	29	44
Total	35	65	100

(i) Compute the probability that the promoted technician is a graduate.

(4 marks)

(ii) If the promoted technician is a woman, then calculate the probability that she is a non-graduate.

(6 marks)

(iii) Obtain the probability that the promoted technician is a non-graduate when it is not known that the promoted technician is a woman.

(3 marks)

(iv) E is an event for the promoted technician is non-graduate and F is an event for the promoted technician is a woman, determine whether these two events are independent or not.

(5 marks)

(b) David, Kevin, and Anita are three doctors in a clinic. Dr. David sees 40% of the patients, Dr. Anita sees 25% of the patients and 35% of the patients are seen by Dr. Kevin. Further 10% of Dr. David's patients are on Medicare, while 15% of Dr. Anita's and 20% of Dr. Kevin's patients are on Medicare. It is found that a randomly selected patient is a Medicare patient. Find the probability that he/she is Dr. Kevin's patient.

(7 marks)

Q3 The following values represent advertising rates paid by a regional catalogue retailer that advertises on radio.

Table Q3

Number of year	1	2	3	4	5
Radio Rates (RM)	300	310	330	346	362
Probability $\Pr(X)$	0.3	0.25	0.17	0.13	0.15

(a) Show that the given data is a probability distribution function.
(3 marks)

(b) Calculate the probability that the number of years not less than 3.
(4 marks)

(c) Compute the average number and variance of years.
(7 marks)

(d) Obtain the percentage that the number of years is less than the average number of years.
(6 marks)

(e) Determine a simple index number for each advertisement using year 1 as the base year.
(5 marks)

Q4 (a) The probability that a fluorescent bulb burns for at least 500 hours is 0.90. Of eight such bulbs, compute

(i) the probability that all burn for at least 500 hours.
(3 marks)

(ii) the expected value of the number of bulbs that burn for at least 500 hours.
(3 marks)

(b) The number of bottles of shampoo sold monthly by a certain discount is a normal random variable with mean 212 and standard deviation 40. Calculate the probability that next month's shampoo sales will be

(i) not more than 286.
(6 marks)

(ii) greater than 200 but less than 250.
(6 marks)

(c) The number of defective parts produced per shift can be modeled using a discrete random variable. Assume that, on average, three defective parts are produced. Estimate the percentage that at most eleven defective parts are produced in the next three shifts.
(7 marks)

- END OF QUESTIONS -

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FORMULA

$$\tilde{x} = L_B + \left(\frac{\frac{(\sum f_i)+1}{2} - F_B}{f_m} \right) \times C$$

$$\hat{x} = L_B + \left(\frac{\Delta_B}{\Delta_B + \Delta_A} \right) \times C$$

$$Q = L_B + \left(\frac{\frac{n+1}{4} - F_B}{f_m} \right) \times C$$

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$$

$$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}x_i^2 - \left(\frac{1}{N}\sum_{i=1}^{N}x_i\right)^2$$

$$\sigma^2 = \frac{1}{N}\left[\sum_{i=1}^{N}f_i x_i^2 - \frac{1}{N}\left(\sum_{i=1}^{N}f_i x_i\right)^2\right]$$

$$I_t = \frac{y_t}{y_0} \times 100$$

$$I_t = \frac{\sum p_t}{\sum p_0} \times 100$$

$$\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$$

$$\Pr(A \cap B) = \Pr(B) \times \Pr(A \mid B)$$

$$E(X) = \int_{-\infty}^{\infty} x f(x)dx$$

$$E[g(x)] = \int_{-\infty}^{\infty} g(x) f(x)dx$$

$$F(x) = \Pr(X \le x) = \int_{-\infty}^{\infty} f(x)dx$$

$$\int_{-\infty}^{\infty} f(x)dx = 1$$

$$\sum_{i=1}^{n}\Pr(X_i) = 1$$

$$\Pr(X = r) = \binom{n}{r} p^r (1-p)^{n-r}$$

$$V_Q = \frac{|Q_3 - Q_1|}{|Q_3 + Q_1|}$$

$$\frac{1}{n}\sum_{i=1}^{n}|x_i - \bar{x}|$$

$$\frac{1}{\sum_{i=1}^{n} f_i}\left(\sum_{i=1}^{n} f_i |x_i - \bar{x}|\right)$$

$$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

$$s^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n}f_i x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n}f_i x_i\right)^2\right]$$

$$s^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n}x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n}x_i\right)^2\right]$$

$$I_t = \frac{\sum q_0 p_t}{\sum q_0 p_0} \times 100$$

$$I_t = \frac{\sum q_t p_t}{\sum q_t p_0} \times 100$$

$$\Pr(A \cap B) = \frac{n(A \cap B)}{n(S)}$$

$$E(X) = \sum_{i=1}^{n} x_i \times \Pr(X = x_i)$$

$$E[g(x)] = \sum_{i=1}^{n} g(x) \times \Pr(X = x_i)$$

$$F(x) = \Pr(X \le x) = \sum_{-\infty}^{x}\Pr(X = x)$$

$$Var(X) = E(x^2) - [E(x)]^2$$

$$Var(X) = E[(x-\mu)^2]$$

$$\Pr(X = r) = \frac{e^{-\mu}\mu^r}{r!}$$