CONFIDENTIAL

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	STATISTICS FOR REAL ESTATE MANAGEMENT
COURSE CODE	:	BPE 15102
PROGRAMME CODE	:	BPD
EXAMINATION DATE	:	JULY 2022
DURATION	:	2 HOURS
INSTRUCTION		1. ANSWER **ALL** QUESTIONS. **2.** THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSED BOOK.** 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 (a) Among 15 male applicants for a postal service job, nine have working wives.

Find the probability that only one has a working wife if three of the male applicants are randomly chosen for futher consideration.

(5 marks)

(b) The number of emergency calls that an ambulance service gets per day is a random variable having the Poisson distribution with the mean is 4.4.

Find the probability that on any given day it will receive only three emergency calls.

(5 marks)

(c) Record show that the probability is 0.00006 that a car tire will go flat while being driven through a certain tunnel.

Find the probability that at least 2 of 10,000 cars passing through the tunnel will get flat tires.

(5 marks)

Q2 (a) The distribution of the weights of all men travelling by air between KLIA and Langkawi Island has a mean of 163kg and a standard deviation of 18kg.

Find the probability that the weight of 36 men travelling on flight is more than 167kg.

(8 marks)

(b) Line Manufacturing Sdn Bhd manufactured two type of cables A and B that have mean breaking strengths of 2500*lb* and 2400*lb* with their standard deviation 150*lb* and 100*lb*, respectively.

Find the probability that the mean breaking strength of Brand A will be at least 150*lb* more than Brand B if 50 cables of Brand A and 25 cables of Brand B are tested.

(12 marks)

Q3 The data of number of bedrooms and the prices at which eight one-family houses sold recently in a certain community is shows in **Table Q3**.

Table Q3: The data of number of bedrooms and the prices of the sold houses.

House	Number of bedrooms, X	Price of the house, Y (RM)
1	3	78,800
2	2	74,300
3	4	83,800
4	2	74,200
5	3	79,700
6	2	74,900
7	5	88,400
8	4	82,900

(a) Sketch a scatter plot for the data in **Table Q3**.

(4 marks)

(b) Find the estimated regression line by using the least square method.

(8 marks)

(c) Predict the sale price of the house of a three-bedroom house.

(2 marks)

(d) Compute;

(i) coefficient of correlation, r

(2 marks)

(ii) coefficient of determination, r^2.

(4 marks)

Q4 (a) A distributor of soft-drink vending machines plans to use the mean number of drinks dispensed during one week by 60 of her machines to estimate the average number dispensed by any one of her machines during one week.

Construct 95% confidence interval for the true average number dispensed by any one of her machines during one week if the 60 randomly selected machines had a mean of 255.3 drinks and a standard deviation of 48.2 drinks.

(8 marks)

(b) Suppose that we want to estimate the mean score of junior high school students on a current event test and to assert with probability 0.90 that the error will be at most 2.2 points.

Compute the sample needed if it can be assumed that the standard deviation is equal to 8.0 points.

(4 marks)

(c) In an air pollution study a random sample of 12 specimens collected within a mile downwind from a certain factory contained on the average 2.58 micrograms of suspended benzene-soluble organic matter per cubic foot with a standard deviation of 0.52.

(i) Find the maximum error, E if $\bar{x} = 2.58$ is used as an estimation of the mean of the population with 95% confidence interval.

(5 marks)

(ii) Construct 95% confidence interval for the mean of the population.

(8 marks)

Q5 (a) Define is null hypothesis and alternative hypothesis.

(2 marks)

(b) Explain briefly what is meant by the significance level of a test.

(3 marks)

(c) Random samples of students from two high schools produced the following scores for a Mathematics examination is shows in Table Q5.

Table Q5: The scores of Mathematics examination of School A and B.

School	Scores									
A	81	71	79	83	76	75	84	90	83	78
B	56	65	62	59	57	64	60	56	66	62

Test at 5% significance level that there is significant difference in the two schools. Assume that the variances of population are unknown but equal.

(15 marks)

-END OF QUESTIONS-

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Special Probability Distributions

Binomial:

$P(X=x) = {}^{n}C_{x} . p^{x} . q^{n-x}$ Mean, $\mu = np$ Variance, $\sigma^2 = npq$

Poisson:

$$P(X=x) = \frac{e^{-\mu} . \mu^{x}}{x!}$$

Normal:

$$P(X > k) = P\left(Z > \frac{k-\mu}{\sigma}\right)$$

Sampling Distribution

Z – value for single mean:

$$Z = \frac{\bar{x}-\mu}{\sigma / \sqrt{n}}$$

Probability related to single Mean:

$$P(\bar{x} > r) = P\left(Z > \frac{r-\mu}{\sigma / \sqrt{n}}\right)$$

Let,

$$\mu_{\bar{x}_1-\bar{x}_2} = \mu_1 - \mu_2 \quad and \quad \sigma_{\bar{x}_1-\bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Z – value for Two Mean:

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - \mu_{\bar{x}_1-\bar{x}_2}}{\sigma_{\bar{x}_1-\bar{x}_2}}$$

Probability related to two Mean:

$$P(\bar{x}_1 - \bar{x}_2 > r) = P\left(Z > \frac{r-\mu_{\bar{x}_1-\bar{x}_2}}{\sigma_{\bar{x}_1-\bar{x}_2}}\right)$$

Estimation

Variance, $s^2 = \frac{\Sigma(x\%\bar{x})^2}{n\%)}$

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Confidence interval for single mean:

Large sample: $n \geq 30$ $\Rightarrow$ σ is known: $\left(\bar{x} - z_{\alpha/2}\left(\sigma / \sqrt{n}\right) < \mu < \bar{x} + z_{\alpha/2}\left(\sigma / \sqrt{n}\right)\right)$

$\Rightarrow$ σ is unknown: $\left(\bar{x} - z_{\alpha/2}\left(s / \sqrt{n}\right) < \mu < \bar{x} + z_{\alpha/2}\left(s / \sqrt{n}\right)\right)$

Small sample: $n < 30$ $\Rightarrow$ σ is known: $\left(\bar{x} - z_{\alpha/2}\left(\sigma / \sqrt{n}\right) < \mu < \bar{x} + z_{\alpha/2}\left(\sigma / \sqrt{n}\right)\right)$

$\Rightarrow$ σ is unknown: $\left(\bar{x} - t_{\alpha/2}\left(s / \sqrt{n}\right) < \mu < \bar{x} + t_{\alpha/2}\left(s / \sqrt{n}\right)\right)$

Hypothesis Testing

Testing of hypothesis on a difference between two means

Variances	*Samples size*	*Statistical test*
Unknown (Equal)	$n_1, n_2 < 30$	$T_{Test} = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{S_p \cdot \sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}}$ $v = n_1 + n_2 - 2$ where $S_P = \sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_1 - 1)s_2^2}{n_1 + n_2 - 2}}$
Unknown (Not equal)	$n_1 = n_2 < 30$	$T_{Test} = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{1}{n}\left(s_1^2 + s_2^2\right)}}$ $v = 2(n - 1)$
Unknown (Not equal)	$n_1, n_2 < 30$	$T_{Test} = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$ $v = \dfrac{\left(\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}\right)^2}{\dfrac{\left(\dfrac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \dfrac{\left(\dfrac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$

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Simple Linear Regressions

Let

$$S_{xy} = \sum_{i=1}^{n} x_i y_i - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)\left(\sum_{i=1}^{n} y_i\right),\quad S_{xx} = \sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right)^2 \text{ and}$$

$$S_{yy} = \sum_{i=1}^{n} y_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} y_i\right)^2$$

Simple linear regression model

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$$

where

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$$

Coefficient of Determination

$$r^2 = \frac{\left(S_{xy}\right)^2}{S_{xx} \cdot S_{yy}}$$

Coefficient of Pearson Correlation

$$r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}}$$