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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019

COURSE NAME	:	STATISTICS FOR REAL ESTATE MANAGEMENT
COURSE CODE	:	BPE 15102
PROGRAMME CODE	:	BPD
EXAMINATION DATE	:	JUNE / JULY 2019
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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Q1 (a) On average, a clinic receives eight patients in 20 minutes. Assume that the number of patients received follows the Poisson distribution.

Find the probability of patient received between 10 am and 10.10 am.

(4 marks)

(b) Given that the probability of certain type of medicine that can cure certain illness is 0.85.

Compute the probability that exactly four out of six patients cured after consuming the medicine.

(4 marks)

(c) The daily wages of worker in an construction firm are normally distributed with a mean of RM50 and a standard deviation of RM10.

Find the value of p if 72% of the workers earn daily wages of more than RM p.

(6 marks)

(d) In a random sample of 250 electric bulbs, 1% of the electric bulbs is produced are defective.

Calculate the probability that 3 electric bulbs are defective by using Poisson distribution.

(6 marks)

Q2 (a) A survey is made on daily calcium intake and osteoporosis for senior citizens in an area. The daily intake per person has a mean of 1100 mg and a standard deviation of 450 mg.

Calculate the probability that the mean daily calcium intake lies between 970 mg and 1230 mg for a random sample of 50 senior citizens.

(10 marks)

(b) The usage of electricity at residential area A is normally distributed with mean of 156 kilowatt per hour and standard deviation of 43 kilowatt per hour. Meanwhile the usage of electricity at residential area B is also normally distributed with mean of 161 kilowatt per hour and its standard deviation is 48 kilowatt per hour. Two samples of size 20 and 25 residences are randomly selected from residential area A and B, respectively.

Calculate the probability that the mean usage of electricity at residential area A is lower than the mean usage of electricity at residential area B.

(12 marks)

Q3 A random sample of 100 measurements taken from a population gives the following results:

$$\sum x = 2980 \quad \text{and} \quad \sum(x-\bar{x})^2 = 3168$$

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

(10 marks)

(b) Suggest two ways to reduce the width of the confidence interval that you obtain.

(3 marks)

Q4 A sample of 20 real estate executives from Kuala Lumpur earns an average of RM300 per day with a standard deviation of RM16, while a sample of 22 real estate executives from Johor Bahru earns an average of RM250 per day with a standard deviation of RM18.

Assume that the variances of population are unknown but equal.

Test at 5% significance level that there are significance difference in Kuala Lumpur executives' average earning and Johor Bahru executives' average earning. (20 marks)

Q5 The data in the **Table Q5** are the circumferences (in feet) and heights (in feet) of trees in a certain forest reserve.

Table Q5: The measurement of circumference and height of trees

Circumference, x	Height, y
1.8	21.0
1.9	33.5
1.8	24.6
2.4	40.7
5.1	73.2
3.1	24.9
5.5	40.4
5.1	45.3
8.3	53.5
13.7	93.8

(a) Find the regression coefficients β_0 and β_1 by using the least-squares method.
(15 marks)

(b) Calculate the coefficient of determination, r^2.
(6 marks)

(c) Calculate the coefficient of correlation, r.
(4 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:

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

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:

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

Probability related to two Mean:

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

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Estimation

Confidence interval for single mean:

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

$\Rightarrow \sigma$ 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: $n < 30 \Rightarrow \sigma$ 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)	$n_1, n_2 < 30$	$T_{Test} = \dfrac{\left(\bar{x}_1 - \bar{x}_2\right) - \left(\mu_1 - \mu_2\right)}{S_p \cdot \sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}}$ $v = n_1 + n_2 - 2$ where $S_p = \sqrt{\dfrac{\left(n_1 - 1\right)s_1^2 + \left(n_1 - 1\right)s_2^2}{n_1 + n_2 - 2}}$
Unknown (Not equal)	$n_1 = n_2 < 30$	$T_{Test} = \dfrac{\left(\bar{x}_1 - \bar{x}_2\right) - \left(\mu_1 - \mu_2\right)}{\sqrt{\dfrac{1}{n}\left(s_1^2 + s_2^2\right)}}$ $v = 2\left(n - 1\right)$
Unknown (Not equal)	$n_1, n_2 < 30$	$T_{Test} = \dfrac{\left(\bar{x}_1 - \bar{x}_2\right) - \left(\mu_1 - \mu_2\right)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$ $v = \dfrac{\left(\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}\right)^2}{\dfrac{\left(\dfrac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \dfrac{\left(\dfrac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$

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Simple Linear Regressions

Let

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

Simple linear regression model

$$\hat{y}=\hat{\beta}_0+\hat{\beta}_1x$$

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

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