UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	STATISTICS FOR MANAGEMENT
COURSE CODE	:	BPA 12303
PROGRAMME CODE	:	BPA / BPB / BPC / BPP
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTIONS	:	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 4. PERFORM YOUR CALCULATIONS IN 3 DECIMAL PLACES

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

Q1 Two types of drugs were used on 5 and 7 patients for reducing their weights in Jerry's 'slim-beauty' health club. Drug A was allopathic and drug B was herbal. The decrease in the weight after using drugs for six months given as follows.

Table Q1: Jerry's slim-beauty helath club data

Drug A	10	12	13	11	14		
Drug B	8	9	12	14	15	10	9

Test the hypothesis if there are significant differences in drug B and drug A by using a 0.001 significance level. Assume that the variances of the population are unknown but equal

(25 marks)

Q2 (a) A consultant noted the time taken by 40 counter servers to complete a standard order is with averaged 78.4 seconds and standard deviation of 13.2 seconds to complete the order.

Construct 95% confidence interval for the true average time required to complete the standard order.

(10 marks)

(b) A study conducted by an airline showed that a random sample of 120 of its passengers disembarking at Kennedy Airport on flights from Europe took on the average 24.15 minutes with standard deviation of 3.29 minutes to claim their luggage and get through customs.

What can they assert with 95% confidence about the maximum error, if they use $\bar{x} = 24.15$ minutes as an estimate of the true average time it takes one of their passengers disembarking at Kennedy airport on flights from Europe to claim his or her luggage and get through customs.

(8 marks)

(c) Before purchasing a large shipment of ground meat, a sausage manufacturer wants to be 95 percent confident that he is in error no more than 2.5 grams in estimating the fat content (per 100 grams of meat).

Determine the sample size if the standard deviation of the fat content (per 100 grams of meat) is assumed to be 8 grams

(7 marks)

Q3 Two rounds of Mobile Legend competition were held and to determine the winner. The following are the scores obtained on the first round and second round in Mobile Legend competition by 12 players.

Table Q3: Scores of 12 players in two rounds

Players	First round	Second round
1	71	83
2	49	62
3	80	76
4	73	77
5	93	89
6	85	74
7	58	48
8	82	78
9	64	76
10	32	51
11	87	73
12	80	89

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

(5 marks)

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

(7 marks)

(c) Interpret the result in Q3(b).

(2 marks)

(d) Estimate the score of player who score 84 in the first round of competition.

(2 marks)

(e) Compute the coefficient of correlation, r and coefficient of determination, r^2.

(7 marks)

(f) Interpret these results in Q3(e).

(2 marks)

Q4 (a) The amount of sodium (in milligrams) in one serving for a random sample of three different kinds of foods is listed in **Table Q4(a)** below.

Determine if there is a sufficient evidence to conclude that a difference in mean sodium amounts exists among condiments, cereals, and desserts at the 0.05 level of significane.

Table Q4(a): Sodium Contents of Foods

Condiments	Cereals	Desserts
270	260	140
130	220	180
230	290	250
180	290	250
80	200	300
70	320	360
200	140	300
		160

(15 marks)

(b) Consider the following **Table Q4(b)**.

Table Q4(b): Partially Completed ANOVA Table

Source	Degree of freedom	Sum of Squares	Mean Squares	F Statistics
Treatment	2	**B**	**C**	**E**
Error	**A**	71.833	**D**	
	13	172.929		

(i) Complete the ANOVA **Table Q4(b)**.

(ii) Determine the number of treatments are being compared in this experiment.

(iii) Find the total number of observations obtained in this experiment?

(iv) Carry out the hypothesis testing to determine the differences between the treatment means at the 0.05 level of significance.

(v) Describe the conclusion in Q4(b)(iv).

(10 marks)

- END OF QUESTIONS –

APPENDIX

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2021 / 2022 PROGRAMME CODE: BPA/BPB/BPC/BPP
COURSE NAME : STATISTICS FOR MANAGEMENT COURSE CODE : BPA 12303

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:

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

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2021 / 2022 PROGRAMME CODE: BPA/BPB/BPC/BPP
COURSE NAME : STATISTICS FOR MANAGEMENT COURSE CODE : BPA 12303

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)	$n_1, n_2 < 30$	$T_{Test} = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{S_p \cdot \sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}}$ $v = n_1 + n_2 - 2$ where $S_p = \sqrt{\dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$
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)	$n_1, n_2 < 30$	$T_{Test} = \dfrac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$ $v = \dfrac{\left(\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}\right)^2}{\dfrac{\left(\dfrac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \dfrac{\left(\dfrac{s_2^2}{n_2}\right)^2}{n_2 - 1}}$

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2021 / 2022 PROGRAMME CODE: BPA/BPB/BPC/BPP

COURSE NAME : STATISTICS FOR MANAGEMENT COURSE CODE : BPA 12303

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

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

Analysis of Variance

Mean square for treatment (between)

$$MS_B = \frac{\sum n_i \left(\bar{x}_i - \bar{x}_{GM}\right)^2}{k-1}$$

Mean square for error (within)

$$MS_W = \frac{\sum (n_i - 1) s_i^2}{N-k}$$

F test value

$$F = \frac{MS_B}{MS_W}$$