UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(TAKE HOME)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	STATISTICS FOR MANAGEMENT
COURSE CODE	:	BPA 12303
PROGRAMME CODE	:	BPB / BPC / BPP
EXAMINATION DATE	:	JULY 2020
DURATION	:	24 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS. (OPEN BOOK EXAMINATION)

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

Q1 Twenty batches of the plastic are used in the study in which from each batch one test item was molded and the hardness measured at some specific point in time. The data in the **Table Q1** are the result of the relation exists between the mean hardness of items molded from the plastic, (Brinell) and the elapsed time since termination of the molding process, (hours).

Table Q1: The mean hardness, and elapsed time,

Batch	Elapsed time, (hours)	Mean hardness, (Brinell)
1	32	230
2	48	262
3	72	323
4	64	298
5	48	255
6	16	199
7	40	248
8	48	279
9	48	267
10	24	214
11	80	359
12	56	305
13	18	189
14	26	250
15	30	299
16	60	220
17	50	360
18	50	315
19	76	260
20	36	240

(a) Sketch a scatter plot for the data in **Table Q1**.

(4 marks)

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

(9 marks)

(c) Estimate the mean hardness when the elapsed time is 52 hours.

(2 marks)

(d) Compute the coefficient of correlation, r and coefficient of determination, . Interpret these results.

(5 marks)

Q2 (a) The brightness of a television picture tube can be evaluated by measuring the amount of current required to achieve a particular brightness level. A random sample of 10 tubes indicated a sample mean of 317.2 microamps and a sample standard deviation is 15.7 microamps.

Construct a 99% confidence interval estimate for the mean current required to achieve a particular brightness level.

(5 marks)

(b) An experiment is done to test the strength of two types of glasses. A sample of 12 pieces of glasses has a mean strength of 40 kilograms and a standard deviation of 2 kilograms. A sample of 13 pieces of glasses has a mean strength of 38 kilograms and a standard deviation of 2.5 kilograms. Assume that the populations are normally distributed, with the variances of population are unknown but equal.

Determine whether there is sufficient evidence to conclude that there is a difference in the mean of strength of the two types of glasses by using 0.05 significance level.

(8 marks)

(c) A sales analyst wants to determine whether there is difference in the mean monthly sales (in RM) of cosmetic company of six sales region in Johor. Several salespersons from each region are chosen and their monthly sales were recorded in **Table Q2**.

Table Q2: The Monthly Sale in Cosmetic Company

Monthly sale (RM)					
Company A	**Company B**	**Company C**	**Company D**	**Compan y E**	**Compan y F**
4250	3930	3960	4350	4150	3970
3980	4010	4020	4450	3890	4160
4020	4050	4130	3880	4568	4370
4130	4220	4350	4574	4480	4290
4050	4177		4130	4430	4580
	4250		4375		4058

	4090				4148

six Determine whether there is evidence of a difference in the monthly sales of the cosmetics company at the 0.05 level of significance.

(17 marks)

-END OF QUESTIONS-

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2019/2020
COURSE NAME : STATISTICS FOR MANAGEMENT
PROGRAMME CODE: BPB / BPC / BPP
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:

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

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:

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

Estimation

Variance,

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2019/2020 PROGRAMME CODE: BPB / BPC / BPP
COURSE NAME : STATISTICS FOR MANAGEMENT COURSE CODE : BPA 12303

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

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2019/2020
COURSE NAME : STATISTICS FOR MANAGEMENT
PROGRAMME CODE: BPB / BPC / BPP
COURSE CODE : BPA 12303

Simple Linear Regressions

Let

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

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

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

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