



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

School of  
Professional and  
Continuing  
Education  
(SPACE)

---

**FINAL EXAMINATION / PEPERIKSAAN AKHIR**  
**SEMESTER I – SESSION 2021 / 2022 / SEMESTER I – SESI 2021 / 2022**  
**PROGRAM KERJASAMA**

COURSE CODE : DDWG 2213  
KOD KURSUS

COURSE NAME : BUSINESS STATISTICS  
NAMA KURSUS : STATISTIK PERNIAGAAN

YEAR / PROGRAMME : 2 DDWG / 2 DDWP  
TAHUN / PROGRAM

DURATION : 3 HOURS (INCLUDING SUBMISSION HOUR)  
TEMPOH : 3 JAM (TERMASUK MASA PENGHANTARAN)

DATE : DECEMBER 2021 / JANUARY 2022  
TARIKH : DISEMBER 2021 / JANUARI 2022

---

**INSTRUCTION / ARAHAN:**

1. The question paper consists of **1 PART** only.  
*Kertas soalan terdiri daripada 1 BAHAGIAN sahaja.*
  2. Answer **ALL** questions and write your answers on the answer sheet.  
*Jawab SEMUA soalan dan tulis jawapan anda pada kertas jawapan.*
  3. Write your name, matric no., identity card no., course code, course name, section no. and lecturer's name on the first page (in the upper left corner) and every page thereafter on the answer sheet.  
*Tulis nama anda, no. matrik, no. kad pengenalan, kod kursus, nama kursus, no. seksyen dan nama pensyarah pada muka surat pertama (penjuru kiri atas) kertas jawapan dan pada setiap muka surat jawapan.*
  4. Each answer sheet must have a page number written at the bottom right corner.  
*Setiap helai kertas jawapan mesti ditulis nombor muka surat pada bahagian bawah penjuru kanan.*
  5. Answers should be handwriting, neat and clear.  
*Jawapan hendaklah ditulis tangan, kemas dan jelas menggunakan huruf cerai.*
- 

**WARNING / AMARAN**

Students caught copying / cheating during the examination will be liable for disciplinary actions and the faculty may recommend the student to be expelled from sitting for exam.  
*Pelajar yang ditangkap meniru / menipu semasa peperiksaan akan dikenakan tindakan disiplin dan pihak fakulti boleh mengesyorkan pelajar diusir dari menduduki peperiksaan.*

---

This examination paper consists of **10** pages including the cover.  
*Kertas soalan ini mengandungi 10 muka surat termasuk kulit hadapan.*

**ONLINE EXAMINATION RULES AND REGULATIONS**  
**PERATURAN PEPERIKSAAN SECARA DALAM TALIAN**

1. Student must carefully listen and follow instructions provided by invigilator.  
*Pelajar mesti mendengar dan mengikuti arahan yang diberikan oleh pengawas peperiksaan dengan teliti.*
2. Student is allowed to start examination only after confirmation of invigilator if all needed conditions are implemented.  
*Pelajar dibenarkan memulakan peperiksaan hanya setelah pengesahan pengawas peperiksaan sekiranya semua syarat yang diperlukan telah dilaksanakan.*
3. During all examination session student has to ensure, that he is alone in the room.  
*Semasa semua sesi peperiksaan pelajar harus memastikan bahawa dia bersendirian di dalam bilik.*
4. During all examination session student is not allowed to use any other devices, applications except other sites permitted by course lecturer.  
*Sepanjang sesi peperiksaan pelajar tidak dibenarkan menggunakan peranti dan aplikasi lain kecuali yang dibenarkan oleh pensyarah kursus.*
5. After completing the exam student must inform invigilator via the set communication platform (eg. WhatsApp etc.) about completion of exam and after invigilator's confirmation leave examination session.  
*Selepas peperiksaan selesai, pelajar mesti memaklumkan kepada pengawas peperiksaan melalui platform komunikasi yang ditetapkan (contoh: Whatsapp dan lain-lain) mengenai peperiksaan yang telah selesai dan meninggalkan sesi peperiksaan selepas mendapat pengesahan daripada pengawas peperiksaan.*
6. Any technical issues in submitting answers online have to be informed to respective lecturer within the given 30 minutes. Request for re-examination or appeal will not be entertain if complains are not made by students to their lecturers within the given 30 minutes.  
*Sebarang masalah teknikal dalam menghantar jawapan secara dalam talian perlu dimaklumkan kepada pensyarah masing-masing dalam masa 30 minit yang diberikan. Permintaan untuk pemeriksaan semula atau rayuan tidak akan dilayan sekiranya aduan tidak dibuat oleh pelajar kepada pensyarah mereka dalam masa 30 minit yang diberikan.*
7. During online examination, the integrity and honesty of the student is also tested. At any circumstances student is not allowed to cheat during examination session. If any kind of cheating behaviour is observed, UTM have a right to follow related terms and provisions stated in the respective Academic Regulations and apply needed measures.  
*Semasa peperiksaan dalam talian, integriti dan kejujuran pelajar juga diuji. Walau apa pun keadaan pelajar tidak dibenarkan menipu semasa sesi peperiksaan. Sekiranya terdapat sebarang salah laku, UTM berhak untuk mengikuti terma yang dinyatakan dalam Peraturan Akademik.*

**INSTRUCTION** : Answer **ALL** questions.

**60 MARKS / [60 MARKAH]**

**[ARAHAN** : *Jawab SEMUA soalan.*]

**Q1.** The following are the numbers of dinner customers served by a restaurant on 20 consecutive days.

*[Berikut adalah bilangan pelanggan bagi makan malam yang dilayan oleh sebuah restoran selama 20 hari berturut-turut.]*

46	61	66	70	52	62	66	71	56	63
67	75	59	64	68	79	59	65	69	88

a) Calculate the sample mean, median, mode and standard deviation of the sample data.

*[Kira min, median, mod dan sisihan piawai bagi data sampel.]*

**(6M)**

There are two new data additions for the above dataset. The data are 38 and 90.

*[Terdapat pertambahan dua data baharu untuk set data di atas. Data tersebut ialah 38 dan 90.]*

b) Based on the latest addition of data, calculate the new mean for this dataset.

*[Berdasarkan tambahan data yang terkini, kirakan purata yang baharu untuk set data ini.]*

**(2M)**

c) Identify either these two data are outliers or not. The latest standard deviation is at 11.65.

*[Kenal pasti sama ada kedua-dua data ini adalah outliers atau tidak. Sisihan piawai terkini adalah pada 11.65.]*

**(2M)**

**Q2.** The ducks at a farm have a mean weight of 2100 g with a standard deviation of 180 g. The weights of the ducks are closely approximated by a normal curve.

*[Itik-itik di sebuah ladang mempunyai min berat 2100 g dengan sisihan piawai 180 g. Berat itik adalah hampir dengan lengkung normal.]*

a) Find the probability of all ducks having the weights between 1600 g and 2100 g.  
[Cari kebarangkalian bahawa semua itik mempunyai berat di antara 1600 g dan 2100 g.]  
(4M)

b) If a random sample of 20 ducks is chosen, what is the probability the sample mean weight will be more than 2040 g?  
[Sekiranya sebanyak 20 ekor sampel itik dipilih secara rawak, apakah kebarangkalian berat min sampel akan melebihi 2040 g?]  
(3M)

c) At what weight represent at least 75% of the data.  
[Pada berat berapakah mewakili sekurang-kurangnya 75% daripada data.]  
(3M)

Q3. Data from the house rental websites shows that 64% of houses are strata and 47% are fully furnished while 25% of houses have both.  
[Data dari laman web sewaan rumah menunjukkan bahawa 64% rumah strata dan 47% dilengkapi perabot manakala 25% rumah ada kedua-duanya.]

a) Based on statement above, copy and complete contingency table below:  
[Berdasarkan kenyataan di atas, salin dan lengkapkan jadual kontigensi di bawah:]

	<b>Strata</b> [Strata]	<b>Non-strata</b> [Bukan Strata]	<b>Total</b> [Jumlah]
<b>Fully Furnished</b> [Dilengkapi Perabot]	0.25		0.47
<b>Not Fully Furnished</b> [Tidak Dilengkapi Perabot]			
<b>Total</b> [Jumlah]	0.64		1.0

Contingency Table / [Jadual Kontigensi]

(5M)

- b) State the probability that a house is fully furnished, given that it is also strata.  
*[Nyatakan kebarangkalian rumah itu dilengkapi perabot, dalam masa yang sama rumah itu juga strata.]*

(1M)

- c) Construct a tree diagram for a given fully furnished or not fully furnished.  
*[Bina rajah pokok untuk rumah dilengkapi perabot atau tidak dilengkapi perabot.]*

(4M)

- Q4.** A manufacturing firm purchases an identical component from three independent suppliers that differ in unit price and quantity supplied. Data on unit price and quantities for the base year 2017 and the year 2020 are given in Table 1.

*[Sebuah firma pembuatan membeli komponen yang serupa daripada tiga pembekal bebas yang berbeza dalam harga unit dan kuantiti yang dibekalkan. Data harga seunit dan kuantiti untuk tahun asas 2017 dan tahun 2020 diberikan dalam Jadual 1.]*

Supplier [Pembekal]	Quantity / [Kuantiti]		Unit Price / [Harga Unit] (RM)	
	2017	2020	2017	2020
X	1500	2500	5.45	6.00
Y	2000	2700	5.60	5.95
Z	1200	2000	5.50	6.20

**Table 1 / [Jadual 1]**

- a) Calculate the aggregate price index for all components for 2020.

*[Kira indeks harga agregat untuk semua komponen bagi tahun 2020.]*

(2M)

- b) Calculate and interpret the Laspeyres price index for year 2020.

*[Kira dan tafsirkan indeks harga Laspeyres bagi tahun 2020.]*

(4M)

- c) Calculate and interpret the Paasche price index for year 2020.

*[Kira dan tafsirkan indeks harga Paasche bagi tahun 2020.]*

(4M)

**Q5.** Consider an experiment with four groups, with eight values in each. Table 2 contains the ANOVA summary for this experiment.

*[Pertimbangkan eksperimen dengan empat kumpulan, dengan setiap satu mempunyai lapan nilai. Jadual 2 mengandungi ringkasan ANOVA untuk eksperimen ini.]*

<b>Source of Variation</b> <i>[Punca Variasi]</i>	<b>df</b>	<b>Sum of Squares</b> <i>[Kuasa dua Jumlah]</i>	<b>Mean Squares</b> <i>[Kuasa dua Min]</i>	<b>F</b>
<b>Among groups</b> <i>[Antara kumpulan]</i>	3		80	
<b>Within groups</b> <i>[Dalam kumpulan]</i>	28	560		
<b>Total</b> <i>[Jumlah]</i>				

**Table 2 / [Jadual 2]**

a) Copy and complete the ANOVA summary table.

*[Salin dan lengkapkan jadual ringkasan ANOVA.]*

**(2M)**

b) How many samples used in this study?

*[Berapakah bilangan sampel yang digunakan dalam kajian ini?]*

**(1M)**

c) At the 1% level of significance, test whether there is a difference in the population means for all four groups.

*[Pada tahap keertian 1%, uji sama ada terdapat perbezaan purata populasi bagi keempat-empat kumpulan.]*

**(7M)**

Q6. The following data in Table 3 contain information of the calories and fat (in gram) of seven different types of coffee drinks.

[Data dalam Jadual 3 berikut mengandungi maklumat mengenai kalori dan lemak (dalam gram) untuk tujuh jenis minuman kopi.]

Calories / [Kalori]	Fat / [Lemak]
238	7.9
259	3.4
346	22.2
347	19.8
419	16.3
505	21.5
527	18.7

Table 3 / [Jadual 3]

a) Calculate the Pearson coefficient of correlation and interpret its meaning.

[Dapatkan pekali bagi korelasi Pearson dan jelaskan maksud jawapan.]

(4M)

b) Calculate the regression coefficients a and b. State the regression equation relationship between calories and fat.

[Kira pekali regresi a dan b. Nyatakan hubungan persamaan regresi antara kalori dan lemak.]

(4M)

c) Predict the fat of a coffee drink with 400 calories.

[Anggarkan lemak minuman kopi dengan 400 kalori.]

(2M)

**\*\* END OF QUESTIONS / [SOALAN TAMAT] \*\***

## LIST OF FORMULA

### DESCRIPTIVE STATISTICS

For Ungrouped Data:

$$\text{Mean, } \bar{x} = \frac{\sum x}{n}$$

$$\text{Variance, } s^2 = \frac{n \sum x^2 - (\sum x)^2}{n(n-1)}$$

For Grouped Data:

$$\text{Mean, } \bar{x} = \frac{\sum fx}{\sum f}$$

$$\text{Variance, } s^2 = \frac{1}{(\sum f)-1} \left[ \sum fx^2 - \frac{(\sum fx)^2}{\sum f} \right]$$

$$\text{Median, } \tilde{x} = L + \frac{\frac{(\sum f)+1}{2} - f_L}{f_m} \times C$$

$$\text{Mode, } \hat{x} = L + \left( \frac{d_1}{d_1+d_2} \right) \times C$$

### MEASURES OF DISPERSION

$$\text{Coefficient of Variance, } CV = \frac{s}{\bar{x}} \times 100\%$$

$$\text{Coefficient of Skewness, } s_k = \frac{\bar{x} - \text{mode}}{s} \quad \text{or} \quad s_k = \frac{3(\bar{x} - \text{median})}{s}$$

### BASIC PROBABILITY

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

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

### PROBABILITY DISTRIBUTION

$$X \sim N(\mu, \sigma^2) \rightarrow Z \sim N(0, 1) ; Z = \frac{X - \mu}{\sigma}$$

$$\bar{x} \sim N\left(\mu_{\bar{x}}, \sigma_{\bar{x}}^2\right) = N\left(\mu, \frac{\sigma^2}{n}\right) \rightarrow Z \sim N(0, 1) ; Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$X \sim B(n, p) \text{ approximates to } X \sim N(\mu, \sigma^2) \rightarrow X \sim N(np, npq) ; Z = \frac{x - np}{\sqrt{npq}}$$

### HYPOTHESIS TESTING: ONE-SAMPLE TESTS

$$Z\text{-test: } Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}, \sigma \text{ known} \quad t\text{-test: } t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}; df = n - 1, \sigma \text{ unknown and } n < 30$$

Critical values for Z-distribution:

$\alpha$	$Z_\alpha$	$Z_{\alpha/2}$
0.01	2.3263	2.5758
0.025	1.9600	2.2400
0.05	1.6449	1.9600
0.005	2.5758	2.8100



## HYPOTHESIS TESTING: TWO-SAMPLE TESTS

Z-test for two independent samples:

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Z-test for two independent large samples:

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

t-test for two independent samples (equal population standard deviations):

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{S_p^2}{n_1} + \frac{S_p^2}{n_2}}}$$

$$S_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 - 1) + (n_2 - 1)}$$

t-test for two dependent samples:

$$t = \frac{\bar{d} - d_0}{\frac{s_d}{\sqrt{n}}} \quad \text{where} \quad s_d = \sqrt{\frac{\sum d^2 - \left(\frac{\sum d}{n}\right)^2}{n - 1}} \quad \text{and} \quad \bar{d} = \frac{\sum d_i}{n}$$

## ANALYSIS OF VARIANCE (ANOVA)

ANOVA test:

$$SSB = SST_r = \sum \frac{T_c^2}{n_c} - \frac{(\sum X)^2}{n}$$

$$SST_{total} = \sum X^2 - \frac{(\sum X)^2}{n}$$

$$SST_{total} = SST_r + SSE = SSB + SSW$$

$$MST_r = \frac{SST_r}{k - 1}$$

$$MSE = \frac{SSE}{n - k}$$

$$F = \frac{MST_r}{MSE}$$

## CHI-SQUARE ANALYSIS

$\chi^2$ -test:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i} \quad \text{with} \quad E_i = np_i$$

**ANOVA SUMMARY TABLE**

Source	Degrees of Freedom	Sum of Squares	Mean Squares (Variance)	F
Between treatments	$k - 1$	$SSA$	$MSTR = SSA / (k - 1)$	$MSTR / MSE$
Error (within treatments)	$n - k$	$SSE$	$MSE = SSE / (n - k)$	
Total	$n - 1$	$SST$		

**REGRESSION ANALYSIS**

Simple Linear Regression:

$$\hat{y} = a + bx, \text{ where } b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} \text{ and } a = \frac{\sum y}{n} - b \frac{\sum x}{n}$$

Pearson Product-Moment Correlation Coefficient:

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Coefficient of Determination =  $r^2$

**INDEX NUMBERS**

Relative Price $I = \frac{p_t}{p_o} \times 100$	Relative Quantity $I = \frac{q_t}{q_o} \times 100$	Average Price $I = \left( \sum \frac{p_t}{p_o} \times 100 \right) / k$	Aggregate Price $I = \frac{\sum p_t}{\sum p_o} \times 100$
Laspeyres Price $L = \frac{\sum p_t q_o}{\sum p_o q_o} \times 100$	Laspeyres Quantity $L = \frac{\sum q_t p_o}{\sum q_o p_o} \times 100$	Paasche Price $L = \frac{\sum p_t q_t}{\sum p_o q_t} \times 100$	Paasche Quantity $L = \frac{\sum q_t p_t}{\sum q_o p_t} \times 100$