



**FINAL EXAMINATION / PEPERIKSAAN AKHIR
SEMESTER I – SESSION 2020 / 2021
PROGRAM KERJASAMA**

COURSE CODE : DDWG 2213
KOD KURSUS

COURSE NAME : BUSINESS STATISTICS
NAMA KURSUS STATISTIK PERNIAGAAN

YEAR / PROGRAMME : 2 DDWG
TAHUN / PROGRAM

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

DATE : NOVEMBER 2020
TARIKH

INSTRUCTION / ARAHAN:

1. Answer **ALL** questions in **Part A** and only **TWO (2)** questions in **Part B**.
Write your answers on the answer sheet
*Jawab **SEMUA** soalan di **Bahagian A** dan hanya **DUA (2)** soalan di **Bahagian B**.
Tulis jawapan anda pada kertas jawapan.*
 2. A list of statistics formula is attached for reference.
Senarai rumus statistik dilampirkan sebagai rujukan.
 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 handwritten, neat and clear.
Jawapan hendaklah ditulis tangan, kemas dan jelas menggunakan huruf cerai.
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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.

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 entertained 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.

Section A: Answer ALL questions.
(Bahagian A: Jawab SEMUA soalan).

(40 Marks / Markah)

Q1. The following are the numbers of clients for twenty days recorded by a sales representative for a publishing company.

Berikut adalah jumlah pelanggan selama dua puluh hari yang dicatatkan oleh wakil jualan untuk syarikat penerbitan.

12 8 15 11 20 18 14 22 13 26
18 16 25 19 10 7 18 24 15 30

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

Kirakan min, median, mod dan sisihan piawai untuk sampel bagi data.

(b) Calculate the coefficient of skewness. Are the data symmetric or skewed?

Kirakan pekali bagi kepencongan. Adakah data simetri atau terpencong?

[8 M]

Q2. The owner of a cafeteria wanted to know if beverage that enlisted men and women preferred with lunch depended on their ages. On a given day, she categorized her lunch patrons according to age and preferred beverage. A sample of 220 patrons were surveyed and the results are shown in Table 1.

Pemilik kafeteria ingin mengetahui apakah minuman yang disukai lelaki dan wanita bersama makan tengah hari adalah bergantung pada usia mereka. Pada hari tertentu, dia mengkategorikan pelanggan makan tengah hari mengikut umur dan minuman pilihan. Sampel 220 pelanggan diselidik dan hasilnya ditunjukkan dalam Jadual 1.

Age / Umur	Beverage / Minuman	
	Soda / Soda	Iced Tea / Teh Ais
18-25	45	45
26-33	20	55
Over / Lebih 33	5	50

Table 1 / Jadual 1

Find the probability of selecting a patron

Dapatkan kebarangkalian memilih seorang pelanggan

(a) who aged 26-33 years.

yang berumur 26-33 tahun.

(b) who is over 33 years old and prefer iced tea.

yang berumur lebih 33 tahun dan suka teh ais.

(c) who prefer Soda and he/she is 18-25 years.

yang suka Soda dan dia berumur 18-25 tahun.

(d) someone who did not prefer iced tea given he/she is over 33 years.

seseorang yang tidak suka teh ais diberi dia berumur lebih dari 33 tahun.

[8 M]

Q3. The chickens at a farm have a mean weight of 1850 g with a standard deviation of 150 g. The weights of the chicken are closely approximated by a normal curve.

Ayam-ayam di ladang mempunyai min berat 1850 g dengan sisihan piawai 150 g.

Berat ayam adalah hampir dengan lengkung normal.

(i) Find the probability of all chickens having the weights between 1750 g and 1900 g?

Cari kebarangkalian bahawa semua ayam mempunyai berat di antara 1750 g dan 1900 g?

(ii) If a random sample of 100 chickens is chosen, what is the probability the sample mean weight will be less than 1800 g?

Sekiranya sampel rawak sebanyak 100 ayam dipilih, apakah kebarangkalian berat min sampel akan kurang dari 1800 g?

[8 M]

Q4. The data in Table 2 relate the heights and weights of a sample 10 adult men.

Data dalam Jadual 2 adalah berkaitan ketinggian dan berat sampel 10 lelaki dewasa.

Height (inches) <i>Tinggi (inci)</i>	Weight (kg) <i>Berat (kg)</i>
62	120
62	140
63	130
65	150
66	142
67	130
68	135
68	175
70	149
72	168

Table 2 / *Jadual 2*

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

Dapatkan pekali bagi korelasi Pearson dan jelaskan maksud jawapan.

(b) Calculate the regression coefficients a and b . State the regression equation relating height to weight of the adult.

Kira pekali regresi a dan b . Nyatakan persamaan regresi yang berkaitan ketinggian dengan berat orang dewasa.

(c) Predict the weight of a man whose height is 64 inches.

Anggarkan berat lelaki dengan ketinggian 64 inci.

[8 M]

- Q5. 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 2012 and the year 2015 are given in Table 3.

Sebuah firma pembuatan membeli komponen yang serupa dari tiga pembekal bebas yang berbeza dalam harga unit dan kuantiti yang dibekalkan. Data harga seunit dan kuantiti untuk tahun asas 2012 dan tahun 2015 diberikan dalam Jadual 3.

Supplier <i>Pembekal</i>	Unit Price / <i>Harga Unit</i> (RM)		Quantity / <i>Kuantiti</i>	
	2012	2015	2012	2015
A	5.45	6.00	150	160
B	5.60	5.95	200	250
C	5.50	6.20	120	140

Table 3 / *Jadual 3*

- (a) Calculate the aggregate price index for all products for 2015.
Kira indeks harga agregat untuk semua produk bagi tahun 2015.
- (b) Calculate and interpret the Laspeyres price index for year 2015.
Kira dan tafsirkan indeks harga Laspeyres bagi tahun 2015.
- (c) Calculate and interpret the Paasche price index for year 2015.
Kira dan tafsirkan indeks harga Paasche bagi tahun 2015.

[8 M]

Section B: Answer only TWO (2) questions.
(Bahagian B: Jawab hanya DUA (2) soalan).**(20 Marks / Markah)**

Q1. The owner of specialty coffee shop wants to study coffee purchasing habits of customers at her shop. She selects a random sample of 60 customers during a week with mean amount spent \$7.25 and standard deviation \$1.75.

Pemilik kedai kopi khas ingin mengetahui kebiasaan membeli kopi oleh pelanggan di kedainya. Dia memilih sampel rawak sebanyak 60 pelanggan selama seminggu dengan min jumlah yang dibelanjakan \$ 7.25 dan sisihan piawai \$ 1.75.

(a) At the 0.05 level of significance, is there evidence that the population mean amount spent was different from \$6.50?

Pada tahap keertian 0.05, adakah terdapat bukti bahawa jumlah min populasi yang dibelanjakan lebih dari \$ 6.50?

(b) Suppose that in (a), the sample mean amount spent equals \$6.25 and standard deviation \$ 1.75. What conclusions do you reach?

Andaikan bahawa dalam (a), min sampel yang dibelanjakan sama dengan \$6.25 dan sisihan piawai \$ 1.75. Apakah kesimpulan yang anda buat?

[10 M]

Q2. The Agency for Quality in a country conducted a salary survey of all its members in all areas of manufacturing and service-related institutions. The statistics concerning salaries for these two areas are given in the following Table 4.

Assuming that the population variances from both areas are equal, is there a difference in the variability of salaries between these two areas.

Test at 0.05 level of significance.

Agensi untuk Kualiti di sebuah negara melakukan tinjauan gaji ke atas semua anggotanya di semua bidang institusi perkilangan dan perkhidmatan. Statistik mengenai gaji untuk dua bidang ini diberikan dalam Jadual 4 berikut

Dengan andaian bahawa varians populasi di kedua-dua bidang adalah sama, adakah terdapat perbezaan gaji antara kedua-dua bidang ini.

Uji pada tahap keertian 0.05.

Sample Statistics / <i>Sampel Statistik</i>	Area A / <i>Bidang A</i>	Area B / <i>Bidang B</i>
Size / <i>Saiz</i>	128	39
Mean / <i>Min</i>	93,123	73,045
Standard Deviation / <i>Sisihan Piawai</i>	21,186	21,272

Table 4 / *Jadual 4***[10 M]**

Q3. Consider an experiment with four groups, with eight values in each.

Table 5 contains the ANOVA summary for this experiment.

Pertimbangkan eksperimen dengan empat kumpulan, dengan setiap satu mempunyai lapan nilai. Jadual 5 mengandungi ringkasan ANOVA untuk eksperimen ini.

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

Table 5 / *Jadual 5*

(a) Fill and copy the ANOVA summary table.

Lengkap dan salin jadual ringkasan ANOVA.

(b) How many samples involved in this experiment?

Berapakah bilangan sampel yang terlibat dalam eksperimen ini?

(c) At the 5% level of significance, test whether there is a difference in the population means for all four groups.

Pada tahap keertian 5% ,uji sama ada terdapat perbezaan dalam min populasi bagi semua empat kumpulan.

[10 M]

END OF QUESTIONS / SOALAN TAMAT

LIST OF FORMULA**DESCRIPTIVE STATISTICS**

For Ungrouped Data:

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

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

For Grouped Data:

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

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

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

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

MEASURES OF DISPERSION

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

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

BASIC PROBABILITY

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad P(A|B) = \frac{P(A \cap B)}{P(B)}$$

PROBABILITY DISTRIBUTIONS

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

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

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

HYPOTHESIS TESTING: ONE-SAMPLE TESTS

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

Critical values for Z-distribution:

α	Z_α	$Z_{\alpha/2}$
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-test for two independent large samples:

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \qquad z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

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:

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

ANALYSIS OF VARIANCE (ANOVA)

ANOVA test:

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

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

$$SSTotal = SSTr + SSE = SSB + SSW$$

$$MSTr = \frac{SSTr}{k-1}$$

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

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

CHI-SQUARE ANALYSIS

χ^2 -test:

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

ANOVA SUMMARY TABLE

<i>Source</i>	Degrees of Freedom	Sum of Squares	Mean Squares (Variance)	<i>F</i>
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:

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

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

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