Sekolah Pendidikan
Profesional dan
Pendidikan
Berterusan
(SPACE)

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

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.

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 **11** pages including the cover.
*Kertas soalan ini mengandungi **11** 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.

Section A: Answer ALL questions.   **(40 Marks / *Markah*)**
(Bahagian A: 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 pada 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.

   (b) Calculate the coefficient of skewness. Are the data symmetric or skewed?
       Kira pekali bagi kepencongan. Adakah data simetri atau terpencong?

                                                                            [8 M]

Q2.   The owner of a cafeteria wanted to learn more about the patterns of patron demand
       during the weekend time period. She decided to study the demand for dessert during
       this time period. Data were collected from 630 customers and organized in the
       following contingency table in Table 1.
       Pemilik kafetaria ingin mengetahui lebih lanjut mengenai corak permintaan
       pelanggan semasa waktu hujung minggu. Dia memutuskan untuk mengkaji
       permintaan pencuci mulut dalam jangka masa ini. Data dikumpulkan dari 630
       pelanggan dan disusun dalam jadual kontingensi berikut dalam Jadual 1.

Ordered *Pesanan*	Dessert / *Pencuci Mulut*	
	Male / *Lelaki*	Female /*Perempuan*
Yes	50	96
No	250	234

Table 1 / *Jadual 1*

Find the probability of selecting a customer

Dapatkan kebarangkalian memilih seorang pelanggan

(a) who did not order a dessert.

   yang tidak memesan pencuci mulut.

(b) who ordered a dessert is a female .

   yang memesan pencuci mulut adalah perempuan.

(c) who ordered dessert given he is male.

   yang memesan pencuci mulut diberi dia adalah lelaki.

(d) someone who did not order dessert given she is a female.

   seseorang yang tidak memesan pencuci mulut diberi dia adalah perempuan.

   [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 1600 g and

          and 2000 g?

          Cari kebarangkalian bahawa semua ayam mempunyai berat di antara 1600 g

          dan 2000 g?

   (ii)   If a random sample of 30 chickens is chosen, what is the probability the

          sample mean weight will be more than 1700 g?

          Sekiranya sampel rawak sebanyak 30 ekor ayam dipilih, apakah

          kebarangkalian berat min sampel akan melebihi 1700 g?

   [8 M]

Q4.   The following data in Table 2 contain information of the calories and fat (in gram) of

seven different types of coffee drinks.

Data dalam Jadual 2 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 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

relationship between calories and fat.

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

dan lemak.

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

Anggarkan lemak minuman kopi dengan 400 kalori.

[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 *Pembekal*	Unit Price / *Harga Unit* (RM)		Quantity / *Kuantiti*	
	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 kuantiti index for all products for 2015.
      Kira indeks kuantiti 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.   **(20 Marks / *Markah*)**
(*Bahagian B: Jawab hanya DUA (2) soalan*).

Q1. An auditor for government agency was assigned the task of evaluating reimbursement for office visits to physicians paid by Medicare. A sample of 75 reimbursements was audited with mean amount $91.30 and standard deviation $34.55.

Juruaudit agensi kerajaan ditugaskan untuk menilai pembayaran balik lawatan kepada doktor untuk lawatan ke pejabat yang dibayar oleh Medicare. Sampel 75 pembayaran balik diaudit dengan jumlah min $ 91.30 dan sisihan piawai $ 34.55.

(a) At the 0.05 level of significance, is there evidence that the population mean reimbursement was less than $100?

Pada tahap keertian 0.05, adakah terdapat bukti bahawa min populasi pembayaran balik kurang dari $ 100?

(b) Suppose that in (a), the population mean reimbursement was less than $90. What conclusions do you make?

Andaikan dalam (a), min populasi pembayaran balik kurang dari $90. Apakah kesimpulan yang anda buat?

[10 M]

Q2. A problem with a phone line that prevents a customer from receiving or making calls are upsetting to both the customer and the telecommunications company. Samples of 20 problems reported to two different central offices of a telecommunications company and the time to clear these problems (in minutes) from the customers' lines were recorded. The statistics of time to clear problems are given in Table 4. Assuming that the population variances from both offices are equal, is there evidence of a difference in the mean waiting time between the two offices. Test at 0.05 level of significance.

Masalah dengan talian telefon yang menghalang pelanggan daripada menerima atau membuat panggilan membimbangkan pelanggan dan syarikat telekomunikasi. Contoh 20 masalah dilaporkan kepada dua ibu pejabat berbeza syarikat telekomunikasi berkaitan dan masa untuk menyelesaikan masalah ini (dalam minit) dari talian pelanggan dicatatkan. Statistik masa untuk menyelesaikan masalah diberikan dalam Jadual 4.

Dengan anggapan bahawa varians populasi dari kedua-dua pejabat adalah sama, adakah terdapat bukti perbezaan min waktu menunggu antara kedua-dua pejabat tersebut. Uji pada tahap keertian 0.05.

Sample Statistics / *Sampel Statistik*	Office 1 / *Pejabat 1*	Office 2 / *Pejabat 2*
Size / *Saiz*	20	20
Mean / *Min*	2.214	2.0115
Variance / *Varians*	1.7180	1.8917

Table 4 / *Jadual 4*

[10 M]

Q3. Consider a study with three groups, with a hundred values in each.

Table 5 contains the ANOVA summary for this study.

Pertimbangkan satu kajian dengan tiga kumpulan dengan setiap satu mempunyai seratus nilai. Jadual 5 mengandungi ringkasan ANOVA untuk kajian ini.

Source of Variation *Punca Variasi*	df *dk*	Sum of Squares *Kuasa dua Jumlah*	Mean Squares *Kuasa dua Min*	F
Among groups *Antara kumpulan*	2	1.879		
Within groups *Dalam kumpulan*		31.865		
Total / *Jumlah*	299			

Table 5 / *Jadual 5*

(a) Complete and copy the ANOVA summary table.

Lengkapkan dan salin jadual ringkasan ANOVA.

(b) How many samples used in this study?

Berapakah bilangan sampel yang digunakan dalam kajian ini?

(c) At the 0.05 level of significance, test whether there is a difference in the population means for all three groups.

Pada tahap keertian 0.05 ,uji sama ada terdapat perbezaan min populasi bagi semua tiga kumpulan.   [10 M]

END OF QUESTIONS / *SOALAN TAMAT*

LIST OF FORMULA

DESCRIPTIVE STATISTICS

For Ungrouped Data:

Mean, $\bar{x} = \dfrac{\sum x}{n}$ $\qquad\qquad$ Variance, $s^2 = \dfrac{n\sum x^2 - (\sum x)^2}{n(n-1)}$

For Grouped Data:

Mean, $\bar{x} = \dfrac{\sum fx}{\sum f}$ $\qquad$ Variance, $s^2 = \dfrac{1}{(\sum f)-1}\left[\sum fx^2 - \dfrac{(\sum fx)^2}{\sum f}\right]$

Median, $\tilde{x} = L + \dfrac{\frac{(\sum f)+1}{2} - f_L}{f_m} \times C$ $\quad$ Mode, $\hat{x} = L + \left(\dfrac{d_1}{d_1 + d_2}\right) \times C$

MEASURES OF DISPERSION

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

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

BASIC PROBABILITY

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $\qquad\qquad$ $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$

PROBABILITY DISTRIBUTIONS

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

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

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

HYPOTHESIS TESTING: ONE-SAMPLE TESTS

Z-test: $Z = \dfrac{\bar{X} - \mu}{\sigma/\sqrt{n}}$, σ known $\qquad$ t-test: $t = \dfrac{\bar{X} - \mu}{s/\sqrt{n}}$; $df = n - 1$, σ 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:

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

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:

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

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:

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

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:

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

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

Relative Price	Relative Quantity	Average Price	Aggregate Price
$I = \frac{p_t}{p_o} \times 100$	$I = \frac{q_t}{q_o} \times 100$	$I = (\sum \frac{p_t}{p_0} \times 100)/k$	$I = \frac{\sum p_t}{\sum p_0} \times 100$
Laspeyres Price	*Laspeyres Quantity*	*Paasche Price*	*Paasche Quantity*
$L = \frac{\sum p_t q_o}{\sum p_o q_o} \times 100$	$L = \frac{\sum q_t p_o}{\sum q_o p_o} \times 100$	$P = \frac{\sum p_t q_t}{\sum p_o q_t} \times 100$	$P = \frac{\sum q_t p_t}{\sum q_o p_t} \times 100$