UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan Profesional dan Pendidikan Berterusan (SPACE)

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

COURSE CODE *KOD KURSUS*	:	DDWG 2213
COURSE NAME *NAMA KURSUS*	:	BUSINESS STATISTICS *STATISTIK PERNIAGAAN*
YEAR / PROGRAMME *TAHUN / PROGRAM*	:	2 DDWG
DURATION *TEMPOH*	:	3 HOURS *3 JAM*
DATE *TARIKH*	:	APRIL / MAY 2021 *APRIL /MEI 2021*

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.

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.

Excerpts from online final exam guidelines
Petikan daripada panduan peperiksaan akhir dalam talian Universiti Teknologi Malaysia

Section A: Answer ALL questions. **(40 Marks / *Markah)***
(Bahagian A: Jawab SEMUA soalan).

Q1. The following ordered data are the time it takes for workers in a fast-serving restaurant to serve their customers.
Data yang tersusun berikut adalah masa diambil oleh pekerja di sebuah restoran layan segera untuk melayan pelanggan.

1.02	1.10	1.48	1.48	1.60	1.60	1.60	1.75	1.92	2.10
2.85	3.10	3.30	3.75	3.97	4.02	4.15	4.23	6.32	7.55

(a) Calculate the sample mean, mode, median and standard deviation of the data.
Kirakan min, mod, median 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. A bank has the following data in Table 1 on the gender and marital status of 200 customers.
Sebuah bank mempunyai data berikut dalam Jadual 1 berkaitan jantina dan taraf perkahwinan 200 orang pelanggan.

Marital Status *Taraf Perkahwinan*	Male / *Lelaki*	Female / *Perempuan*
Single / *Bujang*	20	30
Married / *Berkahwin*	100	50

Table 1 / *Jadual 1*

One of these 200 customers is to be selected at random. Find the probability of selecting a customer:
Salah seorang daripada 200 pelanggan akan dipilih secara rawak. Cari kebarangkalian memilih seorang pelanggan:

(a) who is a male / *yang lelaki.*

(b) who is not a single / *yang bukan bujang.*

(c) who is a single and a female / *yang bujang dan perempuan.*

(d) who is not married, given that the customer is male.
yang belum berkahwin diketahui bahawa pelanggan adalah lelaki.

[8 M]

Q3. Gas lighters manufactured by Sustech are claimed to have a mean life of 25 months with a standard deviation of 8 months.
Pemetik gas yang dihasilkan oleh Sustech dikatakan mempunyai min jangka hayat selama 25 bulan dengan sisihan piawai 8 bulan.

(a) Find the probability of all lighters having the mean life between 20 and 25 months.
Cari kebarangkalian bahawa semua pemetik gas mempunyai jangka hayat di antara 20 dan 25 bulan?

(b) If random sample of 40 lighters is tested, what is the probability the sample mean life will be more than 30 months?
Jika sampel rawak 40 pemetik api diuji, apakah kebarangkalian min sampel jangka hayat akan melebihi 30 bulan?

[8 M]

Q4. The data in Table 2 represent the assessed value and the selling price of used cars in the local market.
Data dalam Jadual 2 mewakili nilai anggaran dan harga jualan bagi kereta terpakai di pasaran tempatan.

Assessed Value / *Nilai Anggaran* (in thousand RM*/dalam ribu RM)*	Selling Price / *Harga Jualan* (in thousand RM/*dalam ribu RM)*
28	48
30	51
24	38
36	65
25	37
15	22
22	41
35	63
10	19
31	46
29	46
25	43

Table 2 / *Jadual 2*

(a) Find the Pearson coefficient of correlation between the assessed value and the selling price of used cars. Interpret your answer.
Dapatkan pekali bagi korelasi Pearson antara nilai anggaran dan harga jualan bagi kereta terpakai. Jelaskan jawapan anda.

(b) Calculate the regression coefficients *a* and *b*. State the simple regression equation to predict the selling price.
Kira pekali regresi a dan b. Nyatakan persamaan regresi mudah yang berkaitan bagi meramal harga jualan.

(c) Predict the selling price if the car was assessed at RM33,000.
Ramalkan harga jualan jika kereta dianggar pada RM33,000.

[8 M]

Q5. A manufacturing company has the following data in Table 3 on unit costs and quantities shipped for each of its three products for the base year 2012 and the current year 2015.

Sebuah syarikat pembuatan mempunyai data berikut dalam Jadual 3 bagi kos per unit dan kuantiti penghantaran untuk setiap daripada tiga produk bagi tahun asas 2012 dan tahun semasa 2015.

Products / *Produk*	Mean shipping cost (RM) *Min kos penghantaran*		Quantity / *Kuantiti*	
	2012	2015	2012	2015
A	16.25	32.00	5000	3000
B	12.20	17.40	6500	7500
C	20.00	35.50	2500	3000

Table 3 / *Jadual 3*

(a) Calculate the aggregate price index for all products for 2015.
Kira indeks harga aggregat bagi semua produk untuk tahun 2015.

(b) Calculate and interpret the Laspeyres price index for 2015.
Kira dan tafsirkan indeks harga Laspeyres untuk 2015.

(c) Calculate and interpret the Paasche price index for 2015.
Kira dan tafsirkan indeks harga Paasche untuk 2015.

[8 M]

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

Q1. A recent article in a magazine reported that the mean amount of leisure time per week for Malaysian men is 40.0 hours. You believe this figure is too small and decide to conduct your own test. In a random sample of 60 men, you find that the mean amount of leisure is 35.8 hours per week and the standard deviation of the sample is 12.2 hours. Can you conclude that the information in the article is true?
Assume the population is normally distributed and use significance level $\alpha = 0.02$.
Artikel terkini dalam sebuah majalah melaporkan bahawa jumlah purata masa lapang setiap minggu untuk lelaki Malaysia adalah 40.0 jam. Anda percaya angka ini terlalu kecil dan membuat keputusan untuk menjalankan ujian sendiri. Dalam sampel rawak sebanyak 60 lelaki, anda mendapati bahawa jumlah purata masa lapang ialah 35.8 jam seminggu dan sisihan piawai sampel ialah 12.2 jam.
Bolehkah anda menyimpulkan bahawa maklumat dalam artikel itu benar?
Anggapkan populasi ini tertabur normal dan gunakan tahap keertian $\alpha = 0.02$.

[10 M]

Q2. The market research department for automobile manufacturer wished to compare the mean number of automobile per family in two states of the Peninsular Malaysia. Suppose that a preliminary study of the number of cars per family from each of the two states gave the means and variance for the two samples as shown in Table 4.
At the significance level 0.05, is there a sufficient evidence to indicate a difference in the mean number of automobiles per family for the two states.
Jabatan penyelidikan pasaran untuk pengeluar kereta ingin membandingkan bilangan min kereta setiap keluarga di dua negeri di Semenanjung Malaysia.
Jika satu kajian permulaan bagi bilangan kereta bagi keluarga di setiap negeri memberikan min dan varians untuk kedua-dua sampel seperti yang ditunjukkan dalam Jadual 4. Pada tahap keertian 0.05, adakah terdapat bukti yang mencukupi untuk menunjukkan perbezaan bilangan min kereta setiap keluarga bagi kedua-dua negeri.

[10 M]

Sample Statistics / *Sampel Statistik*	State A / *Negeri A*	State B / *Negeri B*
Size / *Saiz*	200	200
Mean / *Min*	1.30	1.37
Variance / *Varians*	0.53	0.64

Table 4 / *Jadual 4*

Q3. Suppose a golf player wants to compare the mean distances associated with a few different brands of golf balls when struck with a driver. He recorded the distance for each hit in an experiment, and the results are shown in the ANOVA summary in Table 5.

Jika seorang pemain golf mahu membandingkan jarak min berkaitan beberapa jenama bola golf yang berlainan apabila dipukul dengan pemandu.Dia mencatat jarak setiap pukulan dalam satu kajian, dan keputusannya ditunjukkan dalam ringkasan ANOVA dalam Jadual 5.

Source of Variation	df	Sum of Squares	Mean of Squares
Model	3	2794.38	
Within (Error)			
Total	39	3556.68	

Table 5 / *Jadual 5*

(a) Complete and copy the ANOVA table for the experiment.
Lengkapkan dan salin jadual ANOVA untuk kajian tersebut.

(b) How many brands of golf balls were used in this experiment?
Berapakah jenama bola golf yang digunakan dalam kajian ini?

(c) Test whether there is a significant difference in the mean distances among the four different brands of golf balls when struck with a driver at 1% significance level.
Uji sama ada terdapat perbezaan ketara dalam min jarak antara empat bola golf yang berlainan apabila dipukul dengan pemandu pada tahap keertian 1%.

[10 M]

END OF QUESTIONS / *SOALAN TAMAT*

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

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

PROBABILITY DISTRIBUTIONS

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

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

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

HYPOTHESIS TESTING: ONE-SAMPLE TESTS

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

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

Z-test for two independent large samples:

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

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:

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

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:

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

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

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*
$= \frac{\sum p_t q_o}{\sum p_o q_o} \times 100$	$L = \frac{\sum p_t q_o}{\sum p_o q_o} \times 100$	$L = \frac{\sum q_t p_o}{\sum q_o p_o} \times 100$	$P = \frac{\sum p_t q_t}{\sum p_o q_t} \times 100$ $P = \frac{\sum q_t p_t}{\sum q_o p_t} \times 100$