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

COURSE CODE : DDSM 0023
KOD KURSUS

COURSE NAME : FURTHER MATHEMATICS
NAMA KURSUS *MATEMATIK LANJUTAN*

YEAR / PROGRAMME : ENRICHMENT
TAHUN / PROGRAM *PENGUKUHAN*

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

DATE : NOVEMBER 2020
TARIKH

INSTRUCTION / *ARAHAN:*

1. Answer **ALL** (6) questions questions and write your answers on the answer sheet.
   *Jawab **SEMUA** (6) soalan dan tulis jawapan anda pada kertas jawapan.*

2. A list of formula is given at the end of the question paper for reference.
   Senarai rumus di sediakan di bahagian akhir kertas soalan 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.

This examination paper consists of **6** pages including the cover.
Kertas soalan ini mengandungi 6 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.

1. (a)   Simplify the following expressions:

Permudahkan ungkapan berikut:

(i) $\dfrac{12y^5(x^2-1)^2}{72x^2(x+1)^3}$

(ii) $x^2 - 5x^3 + (3x^2 + 1)(x-1)$

(b)   If the equations $f(x) = \dfrac{2}{x-1}$ and $g(x) = x^2$, find the values of the following:

Jika diberi persamaan $f(x) = \dfrac{2}{x-1}$ dan $g(x) = x^2$, dapatkan nilai bagi yang

berikut:

(i) $(f(-1) + g(3))$

(ii) $g(f(0))$

(c)   Express T in terms of u, v and t

Ungkapkan T dalam sebutan u, v dan t.

$$\sqrt{9t^2 T v^3} = \sqrt{t^3 u^2 v^7}$$

[15M]

2.   (a)   Given the function $f(x) = 2 - x - x^2$. Find the vertex of the quadratic function using the method of completing the square. Then sketch the graph of the function.

Diberi fungsi $f(x) = 2 - x - x^2$. Dapatkan titik bucu bagi fungsi kuadratik menggunakan kaedah melengkapkan kuasa dua. Seterusnya lakarkan graf fungsi tersebut.

(b)   What are the values of p and q if $G(x) = x^3 - 2x^2 + px + q$ leaves a remainder of 3 when divided by $(x-1)$ and a remainder of 7 when divided by $(x-2)$.

Apakah nilai-nilai bagi p dan q jika $G(x) = x^3 - 2x^2 + px + q$ meninggalkan baki 3 apabila dibahagi dengan $(x-1)$ dan baki 7 apabila dibahagi dengan $(x-2)$.

[15M]

3. (a) **Solve the following inequalities.**

Selesaikan ketaksamaan berikut.

(i) $x + 2 \leq 2x - 5 \leq 7$ (ii) $2x^2 - x \geq 1$

(b) **An interview regarding a plan to change the organization system of the city council produces the following results as shown in Table 1.**

Suatu temuduga tentang suatu pelan untuk menukar sistem organisasi majlis perbandaran memberikan hasil yang ditunjukkan pada Jadual 1.

Gender / *Jantina*	Support / *Sokong*	Oppose / *Menentang*	Neutral / *Berkecuali*
Male / *Lelaki*	32	18	3
Female / *Perempuan*	15	35	7

Table 1 / *Jadual 1*

(i) **Find the probability that the respondent was a male and the respondent supports the constitutional draft.**

Dapatkan kebarangkalian bahawa responden adalah lelaki dan responden menyokong draf perlembagaan tersebut.

(ii) **Find the probability that the respondent was a female given that the respondent answered "Neutral".**

Dapatkan kebarangkalian bahawa responden adalah perempuan diberikan bahawa responden telah menjawab "Berkecuali".   **[15M]**

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4. (a) **Find the sum of the first 100 terms in arithmetic progression**

$7, 12, 17, 22, 27, \ldots$ n^{th} **term.**

Dapatkan hasiltambah 100 sebutan pertama dalam janjang aritmetik

$7, 12, 17, 22, 27, \ldots$ *sebutan ke-n*

(b) **Given the geometric series** $3 - 1 + \frac{1}{3} - \frac{1}{9} \ldots - \frac{1}{729}$. **Find the number of terms** n **and the sum of** n **terms** S_n.

Diberikan siri geometri $3 - 1 + \frac{1}{3} - \frac{1}{9} \ldots - \frac{1}{729}$. *Dapatkan bilangan sebutan n dan hasiltambah* S_n.   **[15M]**

5. **The following frequency table in Table 2 shows the number of fruit baskets collected for 50 days at a guava orchard.**

Jadual kekerapan pada Jadual 2 berikut menunjukkan bilangan bakul buah-buahan yang dikumpul selama 50 hari di sebuah kebun buah jambu batu.

Class Boundary / *Sempadan Kelas*	Frequency / *Kekerapan*
119.5 - 124.5	1
124.5 - 129.5	3
129.5 -134.5	12
134.5 - 139.5	18
139.5 - 144.5	13
144.5 - 149.5	3

Table 2 / *Jadual 2*

(a) **Construct a histogram consisting of the class boundary and frequency.**

Bina suatu histogram yang mengandungi sempadan kelas dan kekerapan.

(b) **Identify the median and mode class.**

Kenalpasti kelas median dan kelas mod.

(c) **Calculate the mean, median and variance of the grouped data.**

Kirakan min, median dan varians bagi data terkumpul tersebut.   **[20M]**

6. **(a)** **Given $y = x^3 - 3x^2 - 6x$. Find $\dfrac{dy}{dx}$ and the value of tangent to the curve y at $x = 1$.**

Diberi $y = x^3 - 3x^2 - 6x$. Dapatkan $\dfrac{dy}{dx}$ dan nilai bagi tangen kepada lengkung y pada $x = 1$.

(b) **Find $\dfrac{dy}{dx}$: / *Dapatkan* $\dfrac{dy}{dx}$:**

(i) $y = 2x^7 - x^5 + 5x^3 - 7$ **(ii)** $y = (x-3)^2 + 15x - 7$

(c) **Evaluate the integrals: / *Nilaikan pengamir:***

(i) $\int \dfrac{1}{2}x^3 - 6\sqrt{x^5} + \dfrac{1}{x^{\frac{2}{3}}}\, dx$ **(ii)** $\int (3x-1)^2 - 5x^8\, dx$

                                         [20M]

END OF QUESTIONS */ SOALAN TAMAT*

FORMULAE

Arithmetic Progressions	Geometric Progressions
$T_n = a + (n-1)d$ $$S_n = \frac{n}{2}\{2a + (n-1)d\}$$	$T_n = ar^{n-1}$ $$S_n = \frac{a(1-r^n)}{1-r} = \frac{a(r^n-1)}{r-1}, \quad r \neq 1.$$

Statistics Formula for Grouped Data

Sample Mean: $$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$	Sample Variance: $$s^2 = \frac{n\left(\sum f.x_m^2\right) - \left(\sum f.x_m\right)^2}{n(n-1)}$$
Median $$M = L + \left[\frac{\frac{N}{2} - F}{f_m}\right] \times C$$	Mode $$Mod = L + \left(\frac{\lambda_1}{\lambda_1 + \lambda_2}\right) \times C$$

Differentiation

$$\frac{d(u^n)}{dx} = nu^{n-1}\left(\frac{du}{dx}\right)$$	
$$\frac{d(uv)}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$$	$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{dv}{dx} - u\frac{du}{dx}}{v^2}$$

Integration

$$\int x^n dx = \frac{1}{n}x^{n+1} + C, \quad n \neq -1$$

$$\int (ax+b)^n dx = \frac{1}{a(n+1)}(ax+b)^{n+1} + C, \quad n \neq -1$$