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

COURSE CODE : DDWS 1013  
KOD KURSUS

COURSE NAME : MATHEMATICS FOR COMPUTER SCIENCE  
NAMA KURSUS : MATEMATIK UNTUK SAINS KOMPUTER

YEAR / PROGRAMME : 1 / DDWC / DDWD / DDWZ  
TAHUN / PROGRAM : 1/ DDWC / DDWD / DDWZ

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

DATE : DECEMBER 2021  
TARIKH : DISEMBER 2021

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**INSTRUCTION / ARAHAN:**

1. Answer **ALL** (8) questions questions and write your answers on the answer sheet.  
*Jawab **SEMUA** (8) 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.*

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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.*

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This examination paper consists of **7** pages including the cover.  
*Kertas soalan ini mengandungi **7** 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 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.*

1. (a) Copy and shade the area represented by the sets in the Venn diagram 1 and 2 below.

Salin dan lorekkan kawasan yang diwakili oleh set kepada gambarajah Venn 1 dan 2 di bawah.

(i)  $A \setminus B$

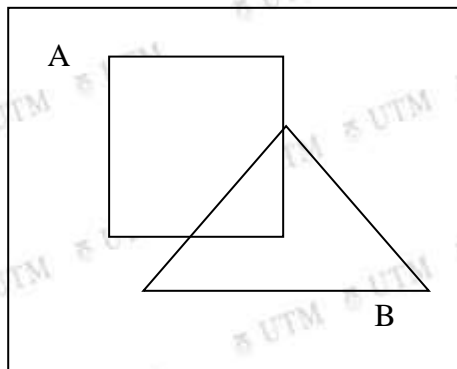


Diagram 1/Rajah 1

(ii)  $A \cup (B \cap C)$

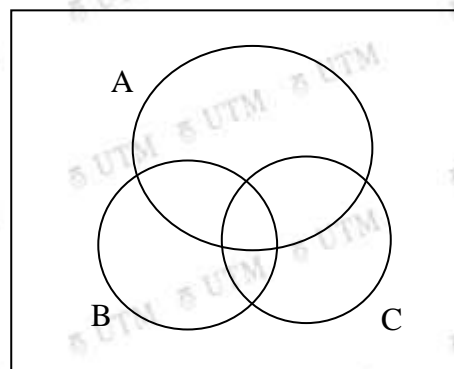


Diagram 2/Rajah 2

(b) In Merdeka Jaya Holdings company, 181 staffs have received gifts as a bonus in a month according to their performance. 111 staffs got handphone as their bonus gift, 110 staffs got washing machine and 130 staffs got hair dryer. Meanwhile, 60 staffs got handphone and washing machine, 70 staffs got handphone and hair dryer and 55 staffs got washing machine and hair dryer. 20 staffs got all the three gifts as their bonus. Sketch a Venn diagram and then find the number of staffs who:

- (i) got handphone only.
- (ii) got washing machine and hairdryer but not handphone.

Di syarikat Merdeka Jaya Holdings, 181 kakitangan telah menerima hadiah sebagai bonus dalam sebulan mengikut prestasi mereka. 111 kakitangan mendapat telefon bimbit sebagai hadiah bonus mereka, 110 kakitangan mendapat mesin basuh dan 130 kakitangan mendapat pengering rambut. Sementara itu, 60 kakitangan mendapat telefon bimbit dan mesin basuh, 70 kakitangan mendapat telefon bimbit dan pengering rambut dan 55 kakitangan mendapat mesin basuh dan pengering rambut. 20 kakitangan mendapat ketiga-tiga hadiah sebagai bonus mereka. Lakarkan gambarajah Venn dan kemudian cari bilangan kakitangan yang:

- (i) mendapat telefon bimbit sahaja.
- (ii) mendapat mesin basuh dan pengering rambut tetapi bukan telefon bimbit.

(6 M)

2. (a) Find the value of  $\frac{34.256}{(124)(11^2)} + 3.2$  to 3 significant values.

Dapatkan nilai  $\frac{34.256}{(124)(11^2)} + 3.2$  sehingga 3 angka bernilai.

- (b) Convert each of the following number:

Tukarkan setiap nombor yang berikut:

- (i) 8898 into a hexadecimal number system.

8898 kepada sistem nombor asas enam belas.

- (ii)  $DBE_{16}$  into an octal number system.

$DBE_{16}$  kepada sistem nombor asas lapan.

- (c) Solve the following arithmetic operation:

Selesaikan operasi aritmetik berikut:

$$10110_2 + 1111_2$$

(6 M)

3. (a) Given  $f: x \rightarrow \frac{4}{x-6}, x \geq 6$  and  $g: x \rightarrow 3x^2 + 7$ .

Diberi  $f: x \rightarrow \frac{4}{x-6}, x \geq 6$ , dan  $g: x \rightarrow 3x^2 + 7$ .

- (i) Find  $(f \circ g)(x)$  and the value of  $(f \circ g)(11)$

Dapatkan  $(f \circ g)(x)$  dan nilai bagi  $(f \circ g)(11)$ .

- (ii) Find  $f^{-1}(x)$ .

Dapatkan  $f^{-1}(x)$ .

- (b) Given  $P(x) = 2x^4 + 6x^2 - 3x + p$  has remainder  $x - 6$  when divided by  $(x + 2)$ .

Find the values of  $p$ .

Diberi  $P(x) = 2x^4 + 6x^2 - 3x + p$  mempunyai baki  $x - 6$  apabila dibahagi dengan  $(x + 2)$ . Dapatkan nilai  $p$ .

(7 M)

4. (a) **By using the method of completing the square, rewrite the quadratic function  $f(x) = -x^2 - 4x + 11$  in the form of  $a(x-h)^2 + k$ . Find the maximum or minimum point and sketch the graph of the function.**

*Dengan menggunakan kaedah melengkapkan kuasa dua, tuliskan fungsi kuadratik  $f(x) = -x^2 - 4x + 11$  dalam bentuk  $a(x-h)^2 + k$ . Dapatkan titik maksimum atau minimum dan lakarkan graf fungsi tersebut.*

- (b) **The roots of the quadratic equation  $16x^2 - 8x + 4 = 0$  are  $\alpha$  and  $\beta$ . Form a new equation whose roots are  $(5\alpha + 5)$  and  $(5\beta + 5)$ .**

*Punca-punca persamaan kuadratik  $16x^2 - 8x + 4 = 0$  ialah  $\alpha$  dan  $\beta$ . Bentukkan persamaan baru dengan punca-punca  $(5\alpha + 5)$  and  $(5\beta + 5)$ .*

**(6 M)**

5. (a) **Find the value of**

*Dapatkan nilai bagi*

(i)  $6 \begin{pmatrix} 5 & 1 & 2 & 4 \\ 0 & 1 & 1 & 3 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} 8 & 7 & 1 & 1 \\ 6 & 4 & 10 & 12 \end{pmatrix}$  (ii)  $\begin{pmatrix} -2 & -7 \\ 8 & 6 \end{pmatrix} \begin{pmatrix} -4 & 3 \\ 2 & 3 \end{pmatrix}$

- (b) **Solve the linear equation by using the Crammer's rule.**

*Selesaikan persamaan linear berikut dengan menggunakan Petua Kramer.*

$$x + y - 2z = 1$$

$$x - 3y + 2z = 1$$

$$x + 2y + z = 0$$

**(7 M)**

6. **Given the following vectors:**

*Diberi vektor-vektor berikut:*

$$\vec{u}_1 = \begin{bmatrix} 2 \\ 5 \\ 9 \end{bmatrix}, \vec{u}_2 = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix} \text{ and/dan } \vec{u}_3 = \begin{bmatrix} 0 \\ 1 \\ 3 \end{bmatrix} \text{ then/maka}$$

- (a) **Find  $\vec{u}_1 \times \vec{u}_3$ .**

*Dapatkan  $\vec{u}_1 \times \vec{u}_3$ .*

- (b) **Find the angle between the vectors  $\vec{u}_1$  and  $\vec{u}_2$ .**

*Dapatkan sudut di antara vektor  $\vec{u}_1$  dan  $\vec{u}_2$ .*

- (c) **Find the distance between the vectors  $\vec{u}_1$  and  $\vec{u}_3$ .**

*Dapatkan jarak di antara vektor  $\vec{u}_1$  dan  $\vec{u}_3$ .*

**(6 M)**

7. (a) Find  $\frac{dy}{dx}$  for  $y = \frac{2}{\sqrt{x}} - 5x^3 + 6x^{\frac{3}{2}}$ .

Dapatkan  $\frac{dy}{dx}$  bagi  $y = \frac{2}{\sqrt{x}} - 5x^3 + 6x^{\frac{3}{2}}$ .

(b) Find the equation of the tangent and normal for the following curve.

Dapatkan persamaan garis tangen dan normal kepada lengkungan berikut.

$$y = 3x^3 - 16x + 10 \text{ at/pada } (2, -14).$$

(6 M)

8. (a) Evaluate the following integrals:

Nilaikan kamiran berikut:

(i)  $\int \frac{26}{2}x^3 + \frac{10}{\sqrt{x}} - \frac{2}{3} \frac{dx}{x^2}$

(ii)  $\int_0^1 (5x^4 - 2)^7 dx$

(b) Find the area of the region bounded by the curve and line in Diagram 3.

Dapatkan luas rantau yang dibatasi oleh lengkungan dan garis dalam Rajah 3.

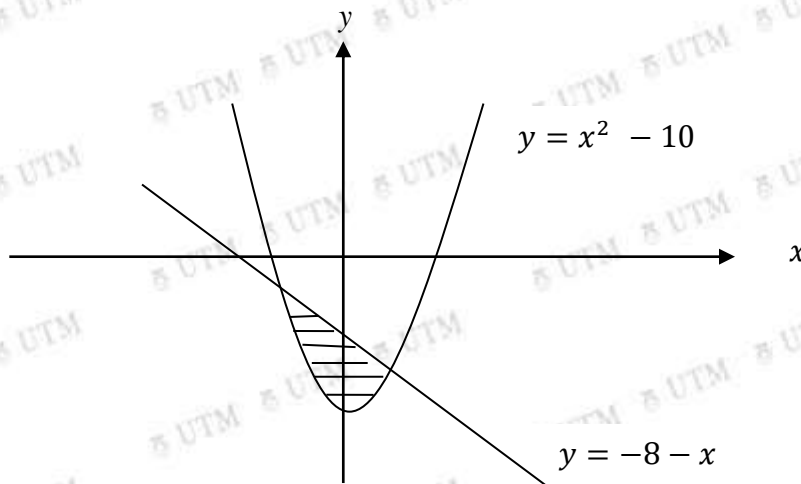


Diagram 3/ Rajah 3

(6 M)

**END OF QUESTION PAPER**

*KERTAS SOALAN TAMAT*

**APPENDIX**

**Solving Linear and Quadratic Equations**

If  $ax^2 + bx + c = 0$ , then the roots are:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  (Quadratic Formula)

If  $ax^2 + bx + c = 0$ , then the sum of roots is  $\alpha + \beta = -\frac{b}{a}$  and the product of roots is  $\alpha\beta = \frac{c}{a}$

Quadratic Equation:  $x^2 - (S.O.R)x + (P.O.R) = 0$

$$a^2 - b^2 = (a + b)(a - b)$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)^2 = a^2 + 2ab + b^2$$

**Matrices and System of Linear Equations**

$$A^{-1} = \frac{1}{|A|} adjA \qquad x_i = \frac{|A_i|}{|A|} \qquad x = A^{-1}b$$

**Vectors**

If  $\vec{u} = \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$  and  $\vec{v} = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix}$ , and  $\theta$  is the angle between  $\vec{u}$  and  $\vec{v}$

Scalar Product  $\vec{u} \bullet \vec{v} = u_1v_1 + u_2v_2 + u_3v_3$       Cross Product  $\vec{u} \times \vec{v} = \begin{bmatrix} u_2v_3 - u_3v_2 \\ u_3v_1 - u_1v_3 \\ u_1v_2 - u_2v_1 \end{bmatrix}$

Length:  $\|\vec{v}\| = \sqrt{v_1^2 + v_2^2 + \dots + v_n^2}$        $\cos \theta = \frac{\vec{u} \bullet \vec{v}}{\|\vec{u}\| \|\vec{v}\|}$

Tangent Line:  $y - y_0 = f'(x_0)(x - x_0)$       Normal Line:  $y - y_0 = -\frac{1}{f'(x_0)}(x - x_0)$

**Differentiation Formula**

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

**Integration Formula**

$$\int x^n dx = \frac{x^{n+1}}{n+1} + c ; (n \neq -1)$$

$$\int (ax + b)^n dx = \frac{1}{a} \frac{(ax + b)^{n+1}}{n+1} + c ; (n \neq -1)$$

$$Area = \int_a^b [f(x) - g(x)] dx$$

$$Volume = \pi \int_a^b [f(x)]^2 dx$$