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FINAL EXAMINATION

COURSE NAME	:	**ENGINEERING MATHEMATICS 2**
COURSE CODE	:	**MAT1022**
EXAMINATION	:	**MEI 2017**
DURATION	:	**2 HOURS**

INSTRUCTION TO CANDIDATES

1. Answer **ALL** question in the Answer Booklet

2. Candidates are not allowed to bring any material to examination room except with the permission from the invigilator.

3. Please check to make sure that this examination pack consist of:
   i. Question Paper
   ii. Answer Booklet

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

*This examination paper consists of **8** printed pages including front page*

Answer ALL Question in Answer Booklet.

Jawab SEMUA Soalan di Buku Jawapan.

Question 1

a) In a geometric series, the third term is 18 and the eighth term is 4374. Find the first term and the common ratio of the series.

Dalam suatu siri geometrik, sebutan ketiga ialah 18 *dan sebutan kelapan ialah* 4374. *Dapatkan sebutan pertama dan nisbah sepunya bagi siri tersebut.*

[4 marks]

b) Write the following as a series;

Tuliskan berikut sebagai suatu siri;

$$\sum_{r=1}^{n} r^2(2r+3)$$

[2 marks]

c) Find the sum of the following series;

Dapatkan hasil tambah bagi siri berikut;

$$1^2 \cdot 11 + 2^2 \cdot 12 + 3^2 \cdot 13 + \ldots\ldots + n^2(n+10)$$

[4 marks]

Question 2

a) Find the term involving x^6 in the expansion of;

Dapatkan sebutan yang melibatkan x^6 dalam kembangan;

$$(3+2x^3)^4$$

[3 marks]

b) Given the binomial function;

Diberi fungsi binomial;

$$(1+x)^{\frac{1}{3}}$$

i) Expand the binomial function above in an ascending power of x up to the term in x^3.

Kembangkan fungsi binomial diatas dengan kuasa x menaik sehingga sebutan dalam x^3.

[2 marks]

ii) By letting $x=\frac{2}{25}$ in above series, evaluate $\sqrt[3]{5}$ correct to five decimal places without using the calculator.

Dengan mengambil $x=\frac{2}{25}$ dalam siri diatas, nilaikan $\sqrt[3]{5}$ betul kepada lima tempat perpuluhan tanpa menggunakan kalkulator.

[5 marks]

Question 3

Given;

Diberi;

$$A=\begin{pmatrix}1 & -2\\ -3 & 4\\ 5 & 6\end{pmatrix},\quad B=\begin{pmatrix}1 & 4 & 8\\ -2 & 6 & -1\end{pmatrix},\quad C=\begin{pmatrix}-2 & 2 & -1\\ 4 & 0 & 2\\ 3 & -2 & 1\end{pmatrix}$$

a) Find the matrix $A+B^T$.

Dapatkan matriks $A+B^T$.

[3 marks]

b) Find the inverse of matrix C by using adjoint method.

Dapatkan songsangan bagi matriks C *dengan menggunakan kaedah adjoin.*

[5 marks]

Question 4

a) Solve the system of linear equations below by using the Crammer's Rule method;

Selesaikan sistem persamaan linear berikut dengan menggunakan kaedah Petua Crammer's;

$$x + 2y + 3z = 6$$
$$2x - 3y + 2z = 14$$
$$3x + y - z = -2$$

[6 marks]

b) Solve the system of linear equations below by using the Gauss elimination method;

Selesaikan sistem persamaan linear berikut dengan menggunakan Kaedah penghapusan Gauss;

$$x + 2y + 3z = 6$$
$$2x - 3y + 2z = 14$$
$$3x + y - z = -2$$

[6 marks]

Question 5

Given two vector $\underset{\sim}{a} = 2i + 8j - 2k$ and $\underset{\sim}{b} = -i + j - 3k$.

Diberi dua vektor $\underset{\sim}{a} = 2i + 8j - 2k$ *dan* $\underset{\sim}{b} = -i + j - 3k$.

a) Find the vector $(2\underset{\sim}{a} + 4\underset{\sim}{b})$.

Dapatkan vektor $(2\underset{\sim}{a} + 4\underset{\sim}{b})$.

[2 marks]

b) Find the angle between the vectors $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

Dapatkan sudut diantara vektor $\underset{\sim}{a}$ *dan* $\underset{\sim}{b}$.

[4 marks]

c) Find the area of parallelogram with sides $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

Dapatkan luas parallelogram yang bersisikan vektor $\underset{\sim}{a}$ *dan vektor* $\underset{\sim}{b}$.

[4 marks]

Question 6

a) Simplify;

Ringkaskan;

(i) $3i^2 + 4(2-2i) + 5$

[2 marks]

(ii) $\dfrac{3-i}{2i}$

[2 marks]

b) Find the polar representation of $z = -3 - 3i$. Hence, find z^6 in polar form.
Dapatkan perwakilan kutub bagi $z = -3 - 3i$. *Seterusnya, dapatkan* z^6 *dalam bentuk kutub.*

[6 marks]

[60 MARKS]

END OF QUESTION PAPER

LIST OF FORMULA

SENARAI RUMUS

Arithmetic Progression

$T_n = a + (n-1)d$

$S_n = \frac{n}{2}(2a + (n-1)d)$

Geometric Progression

$T_n = ar^{n-1}$

$S_n = \frac{a(1-r^n)}{1-r}, r < 1$ **or** $S_n = \frac{a(r^n - 1)}{r-1}, r > 1$

Theorems of Finite Series

1. $\sum_{r=1}^{n} 1 = n$
2. $\sum_{r=1}^{n} c = cn$
3. $\sum_{r=1}^{n} r = \frac{n(n+1)}{2}$
4. $\sum_{r=1}^{n} r^2 = \frac{n(n+1)(2n+1)}{6}$
5. $\sum_{r=1}^{n} r^3 = \left(\frac{n(n+1)}{2}\right)^2$

Binomial Theorem for any positive integer, n

$$(a+x)^n = a^n + {}^nC_1 a^{n-1}x + {}^nC_2 a^{n-2}x^2 + {}^nC_3 a^{n-3}x^3 + {}^nC_4 a^{n-4}x^4 + \ldots + x^n = \sum_{r=0}^{n} {}^nC_r a^{n-r}x^r$$

Binomial Theorem when n is not a positive integer

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \ldots$$

Vector

$a = a_1 i + a_2 j + a_3 k$ **and** $b = b_1 i + b_2 j + b_3 k$ **and** θ **is a angle between** a **and** b.

(i) Magnitude: $|a| = \sqrt{a_1^{\,2} + a_2^{\,2} + a_3^{\,2}}$

(ii) Scalar Product: $a \cdot b = |a||b|\cos\theta$; **where** $a \cdot b = a_1 b_1 + a_2 b_2 + a_3 b_3$

Complex Numbers

$|z| = \sqrt{a^2 + b^2}$

$\theta = \tan^{-1}\frac{b}{a}$

$z = r(\cos\theta + i\sin\theta)$

$z^n = r^n(\cos n\theta + i\sin n\theta)$