

QS016
Mathematics
Semester I
2010/2011
1 hour

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Matematik
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1 jam



BAHAGIAN MATRIKULASI
KEMENTERIAN PELAJARAN MALAYSIA
MATRICULATION DIVISION
MINISTRY OF EDUCATION MALAYSIA

UJIAN PERTENGAHAN SEMESTER PROGRAM MATRIKULASI
MID-SEMESTER EXAMINATION

MATEMATIK
1 jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

ARAHAN KEPADA CALON:

Kertas soalan ini mengandungi 7 soalan.

Jawab **semua** soalan pada buku jawapan yang disediakan.

Markah penuh yang diperuntukkan bagi tiap-tiap soalan atau bahagian soalan ditunjukkan dalam kurungan pada penghujung soalan atau bahagian soalan.

Semua langkah kerja hendaklah ditunjukkan dengan jelas.

Kalkulator saintifik yang tidak boleh diprogramkan sahaja boleh digunakan.

Jawapan berangka boleh diberi dalam bentuk π , e , surd, pecahan atau sehingga tiga angka bererti, di mana-mana yang sesuai, kecuali jika dinyatakan dalam soalan.

INSTRUCTIONS TO CANDIDATE:

This question booklet consists of 7 questions.

Answer **all** questions in the answer booklet provided.

The full marks for each question or section are shown in the bracket at the end of each of the question or section.

All steps must be shown clearly.

Only non-programmable scientific calculators can be used.

Numerical answers can be given in the form of π , e , surd, fractions or up to three significant figures, where appropriate, unless stated otherwise in the question.

Kertas soalan ini mengandungi 7 halaman bercetak.
This booklet consists of 7 printed pages.

Kang Kooi Wei

LIST OF MATHEMATICAL FORMULAE

For the quadratic equation $ax^2 + bx + c = 0$:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For an arithmetic series:

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

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

For a geometric series:

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r}, r \neq 1$$

Binomial expansion:

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \dots + \binom{n}{r}a^{n-r}b^r + \dots + b^n,$$

where $n \in \mathbb{N}$ and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$.

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots \text{ for } |x| < 1$$

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1 Solve $2\log_3 x = \log_3 2 + \log_3(3x - 4)$.
[5 marks]

2 Given $(4 - i)x - 3y = 5 + i$. Find the value of x and y where $x, y \in \mathbb{R}$.
[5 marks]

3 If $|x| \geq a$ is defined as $x \geq a$ or $x \leq -a$, then solve $|2x| \geq x^2 - 3$.
[6 marks]

4 Given α and β are roots of $x^2 + 3x + 1 = 0$. Find the quadratic equation with roots $\alpha + \frac{1}{\alpha}$ and $\beta + \frac{1}{\beta}$.
[6 marks]

5 The sum of the first 20 terms of an arithmetic sequence is 50, and the sum of the next 20 terms is -50. Find the first term and common difference of the sequence.
[6 marks]

6 The function P is defined as $P(x) = px^3 + 2x^2 - qx + 2$ where $p, q \in \mathbb{R}$.
 $P(x)$ is divisible by $(x + 2)$ and 8 is the remainder when $P(x)$ is divided by $(x + 1)$.
(a) Find the value of p and q . Hence, factorize $P(x)$ completely.
[5 marks]

(b) Express $\frac{2x^2 - 6x + 1}{P(x)}$ in partial fraction.
[6 marks]

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- 7 (a) Expand $(4+x)^{\frac{1}{2}}$ and $(1+3x)^{-1}$ in ascending powers of x up to the term in x^2 .

[5 marks]

- (b) By using the result from (a), find the expansion of $\frac{(4+x)^{\frac{1}{2}}}{(1+3x)}$ in ascending powers of x up to the term in x^2 . State the range of x for which the expansion is valid.

[6 marks]

END OF QUESTION BOOKLET