

QM016  
Mathematics  
Semester I  
2006/2007  
1 hour



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Matematik  
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2006/2007  
1 jam

**BAHAGIAN MATRIKULASI**  
**KEMENTERIAN PELAJARAN MALAYSIA**  
*MATRICULATION DIVISION*  
*MINISTRY OF EDUCATION MALAYSIA*

**UJIAN PERTENGAHAN SEMESTER PROGRAM MATRIKULASI**  
*MID-SEMESTER EXAMINATION*

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**MATEMATIK**  
1 jam

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**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.

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  $\pi$ , 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.

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  $\pi$ , e, surd, fractions or up to three significant figures, where appropriate, unless stated otherwise in the question.

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Kertas soalan ini mengandungi 7 halaman bercetak.

*This booklet consists of 7 printed pages.*

## 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:

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

$$\text{dengan } n \in N \text{ dan } \binom{n}{r} = \frac{n!}{(n-r)!r!}.$$

1. (a) Solve the equation

$$2^{2(x+1)} + 3(2^x) = 1 \quad [4 \text{ marks}]$$

- (b) Given a complex number,  $z = \frac{-3+i}{1-2i}$ . Express  $z$  in the form of  $a + bi$ .

[3 marks]

2. (a) Simplify  $\frac{1+\sqrt{2}}{1-\sqrt{2}} + \frac{1-\sqrt{2}}{1+\sqrt{2}}$  [2 marks]

- (c) Solve  $\log_2 x + 3\log_x 2 = 4$  [4 marks]

3. If  $\alpha$  and  $\beta$  are the roots of the equation  $2x^2 + x + 5 = 0$ , find the values of  $h$  and  $k$  if  $(\alpha + 1)$  and  $(\beta + 1)$  are the roots of the equation  $2x^2 - 3hx + 2k = 0$ .

[5 marks]

4. Find the solution for  $\frac{3x+4}{x-7} \geq 2$ . [6 marks]

5. The sum of the first two terms and the sum to infinity of a geometric progression are  $\frac{48}{7}$  and 7 respectively. Find the values of the common ratio  $r$ , and the first term when  $r$  is positive.

[5 marks]

6. Express  $(8 - 3x)^{\frac{1}{3}}$  in the form of  $a(1 - bx)^{\frac{1}{3}}$  and hence expand  $(8 - 3x)^{\frac{1}{3}}$  as a series of ascending powers of  $x$ , up to the term in  $x^2$ .
- (a) State the range of  $x$  for which this expansion is valid. [5 marks]
- (b) By using  $x = 1$ , find the approximation for  $\sqrt[3]{5}$  correct to one decimal place. [4 marks]
7. Given a polynomial  $P(x) = 2x^3 - 7x^2 - 10x + 24$ .
- (a) Show that  $(x + 2)$  is a factor of  $P(x)$ . [2 marks]
- (b) Factorize  $P(x)$  completely. [3 marks]
- (c) Find the remainder when  $P(x)$  is divided by  $(x - 3)$ . [2 marks]
- (d) Express  $\frac{210}{P(x)}$  as a partial fractions. [5 marks]

**END OF QUESTION PAPER**