

QM016  
Mathematics  
Semester I  
2005/2006  
1 hour

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Matematik  
Semester I  
2005/2006  
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 3 halaman bercetak.

*This booklet consists of 3 printed pages.*

1. Solve  $\sqrt{x+22} + \sqrt{x+6} = 8$ . [5 marks]

2. Let  $z = \frac{18+4i}{3-i}$ .

(a) Express  $z$  in the form of  $a+bi$ , where  $a$  and  $b$  are real numbers. [3 marks]

(b) Find  $|z|$  and  $\arg z$ . [4 marks]

3. Show that  $2x^2 - 3x + 1 > 0$  can be written in the form  $|4x - 3| > 1$ .  
Then, solve the inequality. [6 marks]

4. Given that  $f(x) = \frac{x^3+2}{x^2(x+1)}$ . Write  $f(x)$  in the form  $P + \frac{Q-x^2}{x^2(x+1)}$ , where  $P$  and  $Q$  are constants. Hence, express  $f(x)$  as partial fractions. [6 marks]

5. Given  $\sum_{i=0}^{\infty} p\left(\frac{1}{3}\right)^i = \sum_{j=3}^{10} (1+3j)$ , where  $p$  is a constant. Find the value of  $p$ . [5 marks]

6. Given that  $Q(x) = px^2 - (p-2)x + 3p^2$  has a remainder of 5 when divided by  $(x-2)$ .

(a) Find the values of  $p$ . [3 marks]

(b) By using the positive value of  $p$  from part (a),

(i) find all the zeros of  $Q(x)$ . [2 marks]

(ii) solve the inequality  $(x-1)^2 Q(x) > 0$ . [4 marks]

7.

(a) Use the binomial formula to expand  $(1+x)^{\frac{1}{2}}$  in ascending powers of  $x$  up to the  $x^3$  term. [2 marks]

(b) Use the result from part (a) and  $\left(1-\frac{x}{2}\right)^{-1} = 1 + \frac{x}{2} + \frac{x^2}{4} + \frac{x^3}{8} + \dots$  to find the expansion

of  $\frac{2}{(2-x)(1+x)^{\frac{1}{2}}}$  in ascending powers of  $x$  up to the  $x^3$  term. State the interval of  $x$

for which the expansion is valid. [7 marks]

(c) By substituting  $x = \frac{1}{3}$  in the result from part (b), find the approximate value of  $\sqrt{3}$  correct to two decimal places. [3 marks]