QS025
Mathematics
Semester II
Session 2011/2012
1 hour

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Matematik
Semester II
Sesi 2011/2012
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 QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

ARAHAN KEPADA CALON:

Kertas soalan ini mengandungi **6** 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 dinyatakan dalam soalan.

INSTRUCTIONS TO CANDIDATE:

This question paper consists of **6** 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 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.

CHOW CHOON WOOI

LIST OF MATHEMATICAL FORMULAE

Numerical Methods

Iteration Method:

$$x_{n+1} = g(x_n)$$

Newton-Raphson Method:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}, \quad n = 1, 2, 3, \ldots$$

Conics

Circle:

$$(x-h)^2 + (y-k)^2 = r^2$$

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

$$xx_1 + yy_1 + g(x+x_1) + f(y+y_1) + c = 0$$

$$r = \sqrt{h^2 + k^2 - c}$$

$$d = \sqrt{a^2 + b^2 + 2ga + 2fb + c}$$

Parabola:

$$(x-h)^2 = 4p(y-k)$$

$$(y-k)^2 = 4p(x-h)$$

$$F(h+p,k) \quad \text{or} \quad F(h,k+p)$$

Ellipse:

$$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$$

$$F(h \pm c, k) \quad \text{or} \quad F(h, k \pm c)$$

1   Find the area enclosed by the graph $y = x + 3$ and $y = x^2 + 1$.

[6 *marks*]

2   Find

(a) $\int (3 + e^x)(2 + e^{-x}) dx.$

[3 *marks*]

(b) $\int x \cos(2 - 4x^2) \, dx$ by using an appropriate substitution method.

[4 *marks*]

3   Given the equation $e^x = \dfrac{2}{x} + 1.$

(a)   Show that there is a real root between 1 and 2.

[3 *marks*]

(b)   By using Newton-Raphson method, find the root of the equation correct to three decimal places, taking 1.5 as the first approximation.

[4 *marks*]

4   Solve the differential equation $\dfrac{dy}{dx} = -2y + 3$ by using integrating factor method. Express y in terms of x.

[7 *marks*]

5   Express $\dfrac{3x^2-7x+6}{(x-3)^2(x+1)}$ in the form of partial fraction.

Hence, evaluate $\displaystyle\int_1^2 \dfrac{3x^2-7x+6}{(x-3)^2(x+1)}\,dx$. Give the answer in the form of $a+\ln b$.

[11 *marks*]

6   The Cartesian equation of an ellipse is given by $4x^2+9y^2-16x+36y+16=0$.

(a)   Express the Cartesian equation of the ellipse in the standard form.

[3 *marks*]

(b)   Determine the coordinates of the centre, vertices and foci of the ellipse.

[6 *marks*]

(c)   Sketch the graph of the ellipse.

[3 *marks*]

END OF QUESTION PAPER