QS015
Mathematics
Semester I
Session 2013/2014
1 hour

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Matematik
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1 jam

BAHAGIAN MATRIKULASI
KEMENTERIAN PENDIDIKAN 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 jika 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 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.

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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:

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

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

For sum to infinity:

$$S_\infty = \frac{a}{1-r}, |r| < 1$$

Binomial expansion:

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

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

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

$|ax| < 1$ where $n \in Z^-$ or $n \in \mathbb{Q}$

1 Evaluate $\dfrac{1}{3-\sqrt{5}}-\dfrac{1}{1+\sqrt{5}}$.

[4 *marks*]

2 Solve the inequality $x-1<x^2-3\leq 2x+5$.

[6 *marks*]

3 If $\log_a\left(\dfrac{x}{a^2}\right)=3\log_a 2-\log_a(x-2a)$, express x in terms of a.

[7 *marks*]

4 (a) Express $z=-\sqrt{3}-i$ in polar form.

[3 *marks*]

(b) Given that the complex number z and its conjugate $\overline{z}$ satisfy the equation $z\overline{z}+2iz=12+6i$. Find the possible values of z.

[4 *marks*]

5 (a) Given the first term of a geometric series is 40 and its sum to infinity is 60. Find the sum of the first forty terms, S_{40} of the series.

[5 *marks*]

(b) Expand $\dfrac{1}{(1-2x)^3}$ in ascending powers of x up to the term in x^3 and state the range of x such that the expansion is valid. Hence, approximate $(0.9)^{-3}$.

[8 *marks*]

6 Given a matrix $T = \begin{pmatrix} 1 & 1 & p \\ 0 & -q & 1 \\ 3 & 2 & 1 \end{pmatrix}$.

(a) Show that $|T| = 1 - q(1 - 3p)$.

[3 *marks*]

(b) Find the values of p and q if $|T| = 6$ and the minor for element a_{22} is -5.

[4 *marks*]

(c) Hence, determine the inverse of T, T^{-1} by using the adjoint method.

[6 *marks*]

END OF QUESTION PAPER