QS015
Mathematics
Semester I
Session 2014/2015
1 hour

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Matematik
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1 jam

KEMENTERIAN PENDIDIKAN MALAYSIA

BAHAGIAN MATRIKULASI
MATRICULATION DIVISION

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 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.

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 If $\begin{vmatrix} -2 & 1 & x+2 \\ 3 & x-4 & 5 \\ 0 & 1 & 3 \end{vmatrix} = 25$, find the value of x.

[5 *marks*]

2 Given a complex number $z = \dfrac{2i}{\sqrt{3}-i}$.

(a) State z in the form of $a+bi$, where a and b are real numbers.

[3 *marks*]

(b) Find the modulus and argument of z.

[4 *marks*]

3 (a) Simplify $\left(3\sqrt{2}+1\right)^2$ in the form $a+b\sqrt{c}$.

[3 *marks*]

(b) If $2\log x + 3\log y = 0$, find y in terms of x.

[4 *marks*]

4 Solve $\dfrac{3x}{x-4} \geq \dfrac{2x}{7}$.

[7 *marks*]

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

State the range of x for which the expansion is valid.

[5 *marks*]

Hence,

(a) show that $(9-2x)^{\frac{1}{2}} \approx 3-\frac{1}{3}x-\frac{1}{54}x^2-\frac{1}{486}x^3+\ldots$

[4 *marks*]

(b) by substituting $x=\frac{1}{2}$ in the expansion in part (a), find the value of $\sqrt{8}$ correct to four decimal places.

[3 *marks*]

6 Given a matrix $A = \begin{bmatrix} 1 & 1 & x \\ 3 & 2 & 5 \\ 2 & 1 & 1 \end{bmatrix}$.

(a) If $M_{31} = -5$, find the value of x.

[2 *marks*]

(b) Hence, find

(i) $|A|$.

[2 *marks*]

(ii) the values of a, b and c if the cofactor matrix of A is

$$\begin{bmatrix} -3 & a & -1 \\ b & -9 & 1 \\ -5 & 10 & c \end{bmatrix}.$$

[4 *marks*]

(iii) A^{-1}.

[4 *marks*]

END OF QUESTION PAPER