QS015
Mathematics
Semester I
Session 2011/2012
1 hour

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Matematik
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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 BOOKLET 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 booklet 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.

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 Given $z_1 = 1+2i$ and $z_2 = 3-2i$. Express $z_1 + \frac{1}{\overline{z}_2}$ in the form of $a+bi$ where $\overline{z}_2$ is the conjugate of z_2.

[5 *marks*]

2 Solve $4^x - 3.2^x - 4 = 0$.

[7 *marks*]

3 (a) Find the determinant of $A = \begin{bmatrix} 2 & 3 & 6 \\ 6 & 2 & -3 \\ 3 & -6 & 2 \end{bmatrix}$.

[3 *marks*]

(b) Given $a = \log_x 2$ and $b = \log_x 3$, express $\log_x\left(\frac{9\sqrt{x}}{4}\right)$ in terms of a and b.

[4 *marks*]

4 Solve the inequality $\left|\frac{3-2x}{x-1}\right| > 3$.

[7 *marks*]

5 (a) The sum of first n terms of an arithmetic progression is $S_n = 2n^2 + 7n$.
Find the first term and the common difference.
Hence, find the 8^{th} term of the progression.

[6 *marks*]

(b) Expand $(1+2x)^{\frac{1}{2}}$ in ascending powers of x until the term including x^3.
By substituting $x = \frac{1}{50}$, evaluate $\sqrt{26}$ correct to four decimal places.

[6 *marks*]

6 Given $A=\begin{bmatrix}-2 & 1 & 1\\ 3 & -2 & 1\\ -1 & 2 & -1\end{bmatrix}$ and $B=\begin{bmatrix}0 & 3 & 3\\ 2 & 3 & 5\\ 4 & 3 & 1\end{bmatrix}$.

(a) Show that $AB = 6I$.

[3 *marks*]

(b) Deduce A^{-1}.

3

[4 *marks*]

(c) Hence, solve the following system of linear equations.

$$\begin{aligned} -4x+2y+2z &= 1\\ 6x-4y+2z &= 2\\ -2x+4y-2z &= 14 \end{aligned}$$

6

[5 *marks*]

END OF QUESTION BOOKLET