QS015/1
Mathematics
Paper 1
Semester I
Session 2014/2015
2 hours

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Matematik
Kertas 1
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KEMENTERIAN
PENDIDIKAN
MALAYSIA

BAHAGIAN MATRIKULASI
MATRICULATION DIVISION

PEPERIKSAAN SEMESTER PROGRAM MATRIKULASI
MATRICULATION PROGRAMME EXAMINATION

MATEMATIK
Kertas 1
2 jam

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

Kertas soalan ini mengandungi **13** halaman bercetak.
This question paper consists of **13** *printed pages.*

SHAMMAL

1 Solve the equation $3^x + 3^{(3-x)} = 12$.

[6 *marks*]

2 Solve the inequality $\frac{1}{6-x} < \frac{1}{x-1}$.

[6 *marks*]

3 Given matrices $\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 1 & 0 \\ a & b & 1 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 1 & 0 & 0 \\ z & 1 & 0 \\ x & y & 1 \end{bmatrix}$ where $\mathbf{B}$ is the inverse of $\mathbf{A}$.

Find x, y and z in terms of a and b.

[6 *marks*]

4 Using algebraic method, find the least value of n for which the sum of the first n terms of a geometric series

$$0.88 + (0.88)^2 + (0.88)^3 + (0.88)^4 + \cdots$$

is greater than half of its sum to infinity.

[7 *marks*]

5 (a) State the interval for x such that the expansion for $(4+3x)^{\frac{3}{2}}$ is valid.

[2 *marks*]

(b) Expand $(4+3x)^{\frac{3}{2}}$ in ascending power of x up to the term in x^3.

[4 *marks*]

(c) Hence, by substituting an appropriate value of x, evaluate $(5)^{\frac{3}{2}}$ correct to three decimal places.

[4 *marks*]

6 (a) Given $f(x) = 2x + 1$ and $g(x) = x^2 + 2x - 1$.

(i) Find $(f - g)(x)$.

[2 *marks*]

(ii) Evaluate $(3g - 2f)(1)$.

[4 *marks*]

(b) Given $f(x) = \sqrt{2x + \frac{1}{2}}$. State the domain and range of $f(x)$.

Hence, on the same axes, sketch the graph of $f(x)$ and $f^{-1}(x)$.

[6 *marks*]

7 Let $z = a + bi$ be a nonzero complex number.

(a) Show that $\frac{1}{z} = \frac{\bar{z}}{|z|^2}$.

[4 *marks*]

(b) Show that if $\bar{z} = -z$, then z is a complex number with only an imaginary part.

[3 *marks*]

(c) Find the value of a and b if $z(2 - i) = (\bar{z} + 1)(1 + i)$.

[5 *marks*]

8 (a) Solve the following equation $|6x^2 + x - 11| = 4$.

[6 *marks*]

(b) Find the solution set for the inequality

$$2 - \left(\frac{x+2}{x-4}\right) < 5.$$

[7 *marks*]

9 Two companies P and Q decided to award prizes to their employees for three work ethical values, namely punctuality (x), creativity (y) and efficiency (z). Company P decided to award a total of RM3850 for the three values to 6, 2 and 3 employees respectively, while company Q decided to award RM3200 for the three values to 4, 1 and 5 employees respectively. The total amount for all the three prizes is RM1000.

(a) Construct a system of linear equations to represent the above situation.

[3 *marks*]

(b) By forming a matrix equation, solve this equation system using the elimination method.

[7 *marks*]

(c) With the same total amount of money spent by company P and Q, is it possible for company P to award 15 employees for their creativity instead of 2 employees? Give your reason.

[3 *marks*]

10 (a) Determine whether $f(x)=\dfrac{1}{x-4}$ and $g(x)=\dfrac{4x+1}{x}$ are inverse function of each other by computing their composite functions.

[5 *marks*]

(b) Given $f(x)=\ln(1-3x)$.

(i) Determine the domain and range of $f(x)$. Then sketch the graph of $f(x)$.

[6 *marks*]

(ii) Find $f^{-1}(x)$, if it exists. Hence, state the domain and range of $f^{-1}(x)$.

[4 *marks*]

END OF QUESTION PAPER