UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2003/2004

February/March 2004

IUK 291E/4 - MATHEMATICS II

[IUK 291E/4 – MATEMATIK II]

Duration: 3 hours

[Masa: 3 jam]

Please check that the examination paper consist of **FIVE (5)** printed pages before you commence this examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **LIMA (5)** muka surat yang bercetak sebelum anda memulakan peperiksaan ini].*

Answer FOUR questions only. Students are allowed to answer all questions in English OR Bahasa Malaysia OR combinations of both.

[Jawab EMPAT soalan sahaja. Pelajar dibenarkan menjawab semua soalan dalam Bahasa Inggeris ATAU Bahasa Malaysia ATAU kombinasi kedua-duanya].

...2/-

1. (a) Sketch the domain of f

$$f(x, y) = \sqrt{\frac{x^2 + y^2}{x^2 - y^2}}$$

(a) Lakarkan domain untuk f

$$f(x, y) = \sqrt{\frac{x^2 + y^2}{x^2 - y^2}}$$

(30 markah)

(b) Show that $f(x,y) = (y-2x)^3 - \sqrt{y-2x}$ satisfies the equation

$$f_{xx} - 4f_{yy} = 0$$

(b) Tunjukkan $f(x,y) = (y-2x)^3 - \sqrt{y-2x}$ memenuhi persamaan

$$f_{xx} - 4f_{yy} = 0$$

(30 markah)

(c) Find the directional derivative in the direction of v at the point (0, 0, 1)

$f(x, y, z) = 2e^{xyz}$ $\quad v = \overline{\nabla} f$

(c) Dapatkan 'directional derivative' dalam arah v pada point (0, 0, 1)

$f(x, y, z) = 2e^{xyz}$ $\quad v = \overline{\nabla} f$

(40 markah)

...3/-

2. (a) At what point on the circle $x^2 + y^2 = 1$ does the product xy have a maximum?

(a) Pada point mana di atas bulatan $x^2 + y^2 = 1$ produk xy adalah maksimum?

(50 markah)

(b) Find the interval of convergence and radius of convergence of the following series.

$$\sum_{k=1}^{\infty} \frac{(x-5)^k}{k^2}$$

(b) Dapatkan sela 'convergence' dan 'radius of convergence' seri-seri berikut.

$$\sum_{k=1}^{\infty} \frac{(x-5)^k}{k^2}$$

(50 markah)

3. (a) Use a double integral to find the area of the region R enclosed between

$y^2 = 9 - x$ and $y^2 = 9 - 9x$

(a) Gunakan integral dubel untuk mendapatkank keluasan untuk region R terangkum di antara

$y^2 = 9 - x$ and $y^2 = 9 - 9x$

(50 markah)

...4/-

(b) Evaluate the triple integral

$$\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_{1}^{5-x} dzdydx$$

(b) Nilaikan integral tripel

$$\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_{1}^{5-x} dzdydx$$

(50 markah)

4. (a) Solve $y''-4y'+13y=0$

(a) Selesaikan $y''-4y'+13y=0$

(50 markah)

...5/-

(b) Deduce the Fourier series of the function

$$f(x) = \begin{cases} -x & for\ -\frac{1}{2}\pi \le x < 0 \\ x & for\ 0 \le x < \pi \\ 2\pi - x & for\ \pi \le x \le \frac{3}{2}\pi \end{cases}$$

(b) Dapatkan kesimpulan fungsian 'Fourier series'

$$f(x) = \begin{cases} -x & for\ -\frac{1}{2}\pi \le x < 0 \\ x & for\ 0 \le x < \pi \\ 2\pi - x & for\ \pi \le x \le \frac{3}{2}\pi \end{cases}$$

(50 markah)

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