

Benha University Faculty of Eng. - Shoubra Eng. Math. & Phy. Department		1 st Year: Surv. Eng. Mathematics B Date: 12 / 6 / 2010	
Time 3 Hours	الامتحان (5) أسئلة في صفحة واحدة و المطلوب الإجابة عن كل الأسئلة		Marks

[1] Find the following integrals: (6 + 7 + 7)

(a) $\int_0^1 \int_2^y (6x + y^2) dx dy$ (b) $\int_0^{\infty} \int_x^{\infty} \frac{2x}{y e^y} dy dx$ (c) $\iint_D \cos \frac{\pi}{2} (x^2 + y^2) dx dy$, D is $x^2 + y^2 = 4$.

[2](a) Verify Green's theorem for the integral $\oint_C (x^2 + y) dy + (x^2 + y^2) dx$, (10)

where C is formed by: $y = x^3$, $y = x$, $x \geq 0$

(b) Write the Hessain matrix of the function $f(x, y, z) = x^3 y^2 + \sin(yz)$ (4)

(c) Show that $P = 4x^2 + 3y^2 + 2z^2 - 2xy - 2xz + 2yz$ is positive definite. (6)

[3](a) Find $B = f(A) = \sqrt{A}$ where $A = \begin{bmatrix} 3 & 1 \\ 2 & 2 \end{bmatrix}$ (6)

(b) Find the logarithmic curve $y = a \ln x + b$ that fits the data: (7)

(2, 2), (3, 5), (4, 8), (6, 9), (7, 11)

(c) Solve the linear system, number of iterations is 3: (7)

$$2x + y + z = 8, \quad x + 2y - z = 4, \quad x - y + z = 2$$

[4](a) Write the table of differences of the data (0, 2), (1, 6), (2, 14), (3, 19) (10)

and then write the relation $y = p(x)$ to obtain the value of y , y' at $x = 1.5$

(b) Write the Fourier integral of the function $f(x) = \begin{cases} 2x, & |x| \leq 1 \\ 0, & |x| > 1 \end{cases}$ (10)

Also, find the integral $\int_0^{\infty} \frac{\sin^2 y - y \sin y \cdot \cos y}{y^2} dy$

[5](a) Write the Fourier cosine series of the function $f(x) = x$, $x \in [0, \pi]$, $f(x + 2\pi) = f(x)$

Also, find the sum $1 + \frac{1}{3^4} + \frac{1}{5^4} + \frac{1}{7^4} + \dots$ (10)

(b) Write the Fourier series of the function $f(x) = 2x$, $x \in [-\pi, \pi]$, $f(x + 2\pi) = f(x)$

Also, find the sum $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$ (10)