

الامتحان مكون من (5) أسئلة مكتوبة في صفحة واحدة و المطلوب الإجابة على كل الأسئلة

Time: 3 Hours

(1) Solve the following P.D.E:

(a) $u_x + 2u_y + 3u = 0$ (b) $4u_{xx} - 4u_{xy} + u_{yy} + 4u_x - u_y - 6u = 0$

(2) Solve the LP problems:

(a) maximize $f = 5x + 4y + 4z - 3u$

s.t $x + y + z \leq 4$

$x + 4y + u \leq 3, \quad x, y, z, u \geq 0.$

(b) minimize $f = x - y - z$

s.t $2x - y + z \leq 4$

$x + 2y + 2z \leq 10$

$-x + y - z \leq 8, \quad x, y, z \geq 0.$

(3)(a) Find the least squares line that fits the data:

(1, 2), (2, 3), (3, 2), (4, 8), (5, 10)

(b) Find the table of differences of the following data and then find the value of y at x = 1.5: (0, 4), (2, 6), (4, 20), (6, 24).

(4)(a) Using the bisection method, number of iterations is 4, find a root to the equation: $f(x) = x^6 + x - 1 = 0$ in the interval [0,1]

(b) Using Simpson's rule, evaluate the integral: $\int_0^2 \frac{\sin x}{1+x^2} dx$

(5)(a) Show that the function $u(x,y) = 2y + \cosh x \cdot \cos y$ is harmonic and find its conjugate $v(x,y)$ such that the function $w = u + iv$ is analytic.

(b) Find $u(x,y), v(x,y)$ of the complex function $f(z) = z^2 + \sin z$ and show that they satisfy Riemman equations.

Good Luck

Dr. Mohamed H. Eid

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Time: 3 Hours

(1) Solve the following LP problems:

(a) maximize $f = x - y + 2z + u$

s.t $x + y + z - u \leq 10$

$x + y + z - 2u \leq 8$

$x + y - z + 2u \leq 6, \quad x, y, z, u \geq 0$

(b) minimize $f = x + 2y + 2z$

s.t $x + y + z \leq 20$

$2x + 3y + 2z = 18$

$x + 3y + 2z \geq 6, \quad x, y, z \geq 0$

(2) Solve the following P.D.E:

(a) $u_x - 2u_y - u = 0, \quad u(0,y) = 3e^{2y}$

(b) $3u_x + 4u_y - 5u = 25x$

(3)(a) Find the exponential curve that fits the data: (1, 3), (2, 5), (3, 6), (4, 8).

(b) Find a root to the equation $x^3 - x^2 + 20x - 4 = 0$ in the interval [0, 0.5], using the inverse interpolation.

(4)(a) Find the Lagrange polynomial of degree 2 to obtain the value of y at x = 0 from the data: (1,1), (2,7), (3,15), (5,40), (6, 45).

(b) Determine and sketch the image of the region $0 \leq x \leq \pi/2, \quad 0 \leq y \leq 4$ under the function $f(z) = \sin z$

(5)(a) Find $u(x,y)$ and $v(x,y)$ of the function $f(z) = \frac{1}{z} + e^{-z}$ and show that they satisfy Riemann's equations.

(b) Show that the function $u(x,y) = y^2 - x^2 + 2y$ is harmonic and find its conjugate $v(x,y)$ such that the function $w = u + iv$ is analytic.

Good Luck

Dr. Mohamed H. Eid