Benha University Faculty of Engineering- Shoubra Math. and Phy. Eng. Department



2<sup>nd</sup> Year- Civil Engineering Mathematics & N. Analysis Date: 20 / 1 / 2010

الزمن 3 ساعات

الامتحان مكون من (5) أسئلة في صفحة واحدة و المطلوب الإجابة عن كل الأسئلة 0

Marks

[1]Solve the following P.D.E:

(14)

(a) 
$$4u_x + 3u_y + 10 u = 10x$$

(b) 
$$u_{xx} - 4u_{xy} - 5u_{yy} = x^2y^2$$

[2](a)Show that the function  $v(x, y) = x^3 - 3xy^2 + 2$  is harmonic and find its conjugate u(x, y) such that the function w = f(z) = u + iv is analytic. (4)

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

(c) Find the integral  $\oint \frac{\cos z}{C(2z-\pi)^2} dz$ , C is |z| = 3 (4)

(d)By Residue theorem, obtain the integral  $\int_{0}^{\infty} \frac{\cos 2x}{x^2 + 1} dx$  (4)

[3](a)Solve the following linear system, number of iterations is 3: (8)

 $2x_1-x_2-x_3+x_4=2$ ,  $x_1+2x_2-x_3-x_4=2$ ,

$$x_1 - x_2 + 3x_3 - 2x_4 = 2$$
,  $x_1 - x_2 + 2x_3 - x_4 = 2$ 

(b)Using trapezoidal rule, compute the integral  $\int_{1}^{\infty} \frac{\sqrt{\sin(1/x)}}{x^2} dx$ ,  $\Delta = 0.2$  (4)

[4]From the data (1, 2), (3, 4), (4, 10), (5, 8):

(15)

- (a) Find the exponential curve that fits the data.
- (b) Write the table of differences of the data and obtain the value of y at x = 0.
- (c) Write the Lagrange's polynomial of degree 2 to obtain the value of x at y = 3.

[5](a)Solve the LP problem: maximize  $f = x_1 - x_2 + 2x_3 + x_4$  (6)

s.t  $x_1 + x_2 + x_3 - x_4 \le 10$ ,  $x_1 + x_2 + x_3 - 2x_4 \le 8$ ,

$$x_1 + x_2 - x_3 + 2x_4 \le 6$$
,  $x_1, x_2, x_3, x_4 \ge 0$ 

(b)Write and solve the dual problem of the LP problem: minimize f = 3x + y (7)

s.t 
$$x-y \le 4$$
,  $-x+y \le 1$ ,  $x+y \ge 3$ ,  $x, y \ge 0$ 

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