

	Answer the following questions:	Time: 3 Hours
1	<p>Solve the following P.D.E:</p> <p>(a) $u_x - 2u_y - u = 0, \quad u(0, y) = 3e^{2y}$</p> <p>(b) $9u_{xx} - 6u_{xy} + u_{yy} + u_x - u_y + 2u = 0$</p> <p>(c) $u_{tt} - 4u_{xx} = 0, \quad 0 < x < 1$ B.C $u(0,t) = u(1,t) = 0$ I.C $u(x,0) = x + 1, \quad u_t(x,0) = x.$</p>	
2	<p>Solve the LP problem:</p> <p>Maximize $f = 3x + y + 4z$ s.t $x + y + 2z \leq 18$ $2x + 3y + 2z = 18$ $x + 2y + 2z \geq 6, \quad x, y, z \geq 0.$</p>	
3	<p>(a) Find the exponential curve that fits the points: (0.2, 1.4), (0.4, 2), (0.6, 2.5), (0.8, 3.2), (1, 3.6).</p> <p>(b) Using the inverse interpolation, find a root to the equation: $x^4 + x - 1 = 0$ in the interval [0.6, 0.9].</p>	
4	<p>(a) Using Taylor's method, solve the differential equation: $y' - xy^2 - y = 0, \quad y(1) = 1.$</p> <p>(b) Solve the system of equations: $2x + y + z = 4$ $x + 3y - 3z = 1$ $x + y + 3z = 5$</p>	
5	<p>(a) Show that the function $u(x,y) = 2x + e^x \cos y$ is harmonic and find its conjugate function $v(x,y)$ such that the function $w = u + iv$ is analytic.</p> <p>(b) Evaluate the following integrals:</p> <p>(i) $\int_C \frac{\cos z}{2z - 13} dz$ (ii) $\int_C \frac{\ln(z + e)}{z} dz$ (iii) $\int_C \frac{\cos z}{(z - \pi)^3} dz$</p> <p>where C is the ellipse $z - 3 + z + 1 = 6.$</p>	

Good Luck

Dr. M.H. Eid