ENGINEERING MATHEMATICS-I
MATLAB

Department of Science and Humanities

Partial Differential Equation:

Form the PDE by eliminating arbitrary constants:

```
syms x y a b p q
z=(x-a)^2+(y-b)^2;
eq1=p==diff(z,x)
c1=solve(eq1,a)
eq2=q==diff(z,y)
c2=solve(eq2,b)
pde=subs(z,a,c1)
pde=subs(pde,b,c2)
```

Output: pde = $\frac{p^2}{4} + \frac{q^2}{4}$

Partial Differential Equation:

Form the PDE by eliminating arbitrary constants: $z = (x + a)(y + b)$

```
syms x y a b p q
z = (x+a)*(y+b);
eq1 = p == diff(z,x);
c1 = solve(eq1,b);
eq2 = q == diff(z,y);
c2 = solve(eq2,a);
pde = subs(z,a,c2);
pde = subs(pde,b,c1)
```

Output: pde = $p\,q$

Partial Differential Equation:

Form the PDE by eliminating arbitrary constants: z = a x + b y + +

```
syms x y a b p q
z = a*x + b*y + a^2 + b^2;
eq1 = p == diff(z,x);
c1 = solve(eq1,a);
eq2 = q == diff(z,y);
c2 = solve(eq2,b);
pde = subs(z,a,c1);
pde = subs(pde,b,c2)
```

Output: pde = $p^2 + x\,p + q^2 + y\,q$

Partial Differential Equation:

Form the PDE by eliminating arbitrary constants: z = a + b

```
syms x y a b p q
z = a*x ^2+ b*y ^2
eq1 = p == diff(z,x);
c1 = solve(eq1,a);
eq2 = q == diff(z,y);
c2 = solve(eq2,b);
pde = subs(z,a,c1);
pde = subs(pde,b,c2)
```

Output: pde = $\frac{p\,x}{2} + \frac{q\,y}{2}$

Partial Differential Equation:

Form the PDE by eliminating the arbitrary function from the z = x y+ f (u) where u (x, y) =

```
syms x y f(u) u(x,y) z p q
u(x,y) = x^2 + y^2;
z = x*y + f(u);
eqn1 = p == diff(z, x);
eqn2 = q == diff(z, y);
f_1 = (p - y) / (2*x)
f_2 = (q - x) / (2*y)
equate = simplify(f_1 == f_2)
```

Output: equate = $x\,(q - x) = y\,(p - y)$

Partial Differential Equation:

Form the PDE by eliminating the arbitrary function from the z = f (u) where u (x, y) =

```
syms x y f(u) u(x,y) z
u(x,y) = x^2 + y^2;
z = f(u);
eqn1 = p == diff(z, x);
eqn2 = q == diff(z, y);
f_1 = p / (2*x);
f_2 = q / (2*y);
equate = simplify(f_1 == f_2)
```

Output: equate = $p\,y = q\,x$

Partial Differential Equation:

Write code for symbolic solution of the 1D Heat Equation Using Separation of Variables

```
syms x t lambda u(x, t) X(x) T(t)
PDE = diff(u, t) == diff(u, x, 2);
u(x, t) = X(x) * T(t);
PDE_sep = subs(PDE, u, X(x)*T(t));
PDE_sep = PDE_sep / (X(x) * T(t));
eq1 = diff(T, t) / T == diff(X, x, 2) / X;
eqT = diff(T, t) == -lambda * T;
eqX = diff(X, x, 2) == -lambda * X;
T_sol = dsolve(eqT)
X_sol = dsolve(eqX)
u_sol = simplify(X_sol * T_sol)
```

Output: u_sol = $C_1\, e^{-\lambda t} \left(C_1\, e^{\sqrt{-\lambda}\, x} + C_2\, e^{-\sqrt{-\lambda}\, x}\right)$

THANK YOU