*Read solution of DE AY1819 S2 (Midterm)*

Given that:

Check for solution:

With , it holds that:. Substituting into , we get:

(valid)

With , it holds that:. Substituting into , we get:

(valid)

So, are solutions of

Check for linearity:

So, are linearly independence

From and , are linearly independence solutions of

Thus, the general solution of is:

a) Given that:

Where:

Characteristic equation of the given ODE:

Since the right hand side of the given equation has three terms , and , therefore the particular solution also has three terms: , respectively.

Solve fore from:

Since, is double root of characteristic equation.

Hence, has the following form:

Solve fore from:

Since, is single root of characteristic equation.

Hence, has the following form:

Solve fore from:

Since, is a single root of characteristic equation.

Hence, has the following form:

So:

b) Given that:

Where:

Characteristic equation of the given ODE:

So, the complement solution is:

Since the right hand side of the given equation has two terms and , therefore the particular solution also has two terms: , respectively.

Solve fore from:

Since, is double root of characteristic equation.

So, has the following form:

Substituting into the equation we obtain:

Therefore:

Solve fore from:

Since, is double root of characteristic equation.

So, has the following form:

Substituting into the equation we obtain:

Therefore:

So:

Thus, the general solution of the given differential equation is:

Differentiating both sides of , we get: .

Taking , we obtain:

Substituting into , it leads to:

Characteristic equation:

Therefore:

From :

Thus, the solution of the given system of differential equations is:

Given that:

Characteristic equation of the given DE:

So, the complement solution is:

Multiply both sides of by , we get:

Integrating both sides, it leads to:

Multiply both sides of by again, we get:

Integrating both sides, it leads to:

Comparing (1) and (2), we obtain the particular solution: