SRM Institute of Science and Technology
Ramapuram Campus
Department of Mathematics
18MAB101T – Calculus And Linear Algebra

Year/Sem: I/I

Branch: Common to ALL B.Tech. except B.Tech. (Business Systems)

Unit – III

ORDINARY DIFFERENTIAL EQUATIONS

Part – B

1. Solve $\left(D^2 - 7D + 12\right)y = 0$.

$(a)\, y = Ae^{3x} + Be^{4x}$ $(b)\, y = Ae^{-3x} + Be^{4x}$

$(c)\, y = Ae^{3x} + Be^{-4x}$ $(d)\, y = Ae^{-3x} + Be^{-4x}$

$m^2 - 7m + 12 = 0$
$(m-3)(m-4) = 0$
$m = 3, 4$
$y = Ae^{3x} + Be^{4x}$ **(Option (a))**

2. Find the particular integral of $\left(D^2 - 9\right)y = e^{-2x}$.

$(a)\, PI = \frac{1}{13}e^{-2x}$ $(b)\, PI = -\frac{1}{5}e^{-2x}$

$(c)\, PI = \frac{x}{5}e^{-2x}$ $(d)\, PI = \frac{1}{5}e^{-2x}$

$$PI = \frac{1}{D^2 - 9} e^{-2x}$$
$$= \frac{1}{4 - 9} e^{-2x}$$
$$= -\frac{1}{5} e^{-2x}$$ **(Option (b))**

3. Find the particular integral of $(D^2 + 3D + 2)y = e^{-2x}$.

$(a) PI = -xe^{-2x}$ $(b) PI = xe^{-2x}$

$(c) PI = \frac{e^{-2x}}{12}$ $(d) PI = \frac{xe^{-2x}}{12}$

$$PI = \frac{1}{D^2 + 3D + 2} e^{-2x}$$
$$= \frac{1}{4 - 6 + 2} e^{-2x}$$
$$= x.\frac{1}{2D + 3} e^{-2x}$$
$$PI = -xe^{-2x}$$ **(Option (a))**

4. Find the particular integral of $(D^2 + 4)y = \sin 2x$.

$(a) PI = -\frac{x \cos 2x}{4}$ $(b) PI = -\frac{\sin 2x}{8}$

$(c) PI = \frac{x \sin 2x}{4}$ $(d) PI = \frac{\sin 2x}{8}$

$$PI = \frac{1}{D^2+4}\sin 2x$$
$$= x.\frac{1}{2D}\sin 2x$$
$$= -x.\frac{\cos 2x}{4}$$ **(Option (a))**

5. Find the particular integral of $(D^2+D+1)y = 3x-1$.

$(a) PI = 3x-4$ $(b) PI = 3x$

$(c) PI = 3x-1$ $(d) PI = 3x^2-4$

$$PI = \frac{1}{D^2+D+1}(3x-1)$$
$$= [1+(D+D^2)]^{-1}(3x-1)$$
$$= (3x-1) - D(3x-1)$$
$$PI = 3x-4$$ **(Option (a))**

6. Find the particular integral of $(D^2+D+1)y = x$

$(a) PI = 3x-4$ $(b) PI = 3x$

$(c) PI = x-1$ $(d) PI = 3x^2-4$

$$PI = \frac{1}{D^2+D+1}(x)$$
$$= [1+(D+D^2)]^{-1}(x)$$
$$= [1-(D+D^2)](x)$$
$$= (x-D(x)) \quad = x-1$$
$$PI = x-1$$

(Option C)

7**. Solve** $(D^3 - 6D^2 + 11D - 6)y = 0$

$(a)\, y = Ae^x + Be^{2x} + Ce^{3x}$ $(b)\, y = Ae^x + Be^{-2x} + Ce^{3x}$

$(c)\, y = Ae^x + Be^{2x} + Ce^{-3x}$ $(d)\, y = Ae^x + Be^{-2x} + Ce^{-3x}$

$m^3 - 6m^2 + 11m - 6 = 0$

$(m-1)(m-2)(m-3) = 0$

$m = 1,2,3$

$C.F = Ae^x + Be^{2x} + Ce^{3x}$

Hence

$y = Ae^x + Be^{2x} + Ce^{3x}$

(Option A)

8**.** Find the particular integral of $(D^2 + D - 2)y = Sinx$

$(a)\, PI = \frac{-1}{10}(\cos x + 3\sin x)$ $(b)\, PI = \frac{1}{10}(\cos x + 3\sin x)$

$(c)\, PI = \frac{-1}{10}(\sin x + 3\cos x)$ $(d)\, PI = \frac{-1}{10}(\sin x - 3\cos x)$

$\text{P.I} = \frac{1}{D-3}\sin x = \frac{D+3}{D^2-9}\sin x$, Rationalizing the denominator

$= \frac{(D+3)\sin x}{-10}$, Putting $D^2 = -1$

$\therefore \text{P.I.} = \frac{-1}{10}(D\sin x + 3\sin x)$

$= \frac{-1}{10}(\cos x + 3\sin x)$

(Option A)

9. Find the complementary function of $(D^2+1)y = \cos ec\, x$.

$(a) CF = (A+Bx)e^x$ $(b) CF = (A+Bx)e^x$

$(c) CF = A\cos x + B\sin x$ $(d) CF = (A\cos x + B\sin x)e^x$

$m^2 + 1 = 0 \Rightarrow m = \pm i$

$CF = A\cos x + B\sin x$ **(Option (c))**

10. Solve $(D^2 + 4D + 4)y = 0$.

$(a) y = Ae^{-2z} + Be^{-2z}$ $(b) y = (A+Bx)e^{-2x}$

$(c) y = \frac{A}{x} + \frac{B}{x^2}$ $(d) y = Ax + Bx^2$

$m^2 + 4m + 4 = 0$

$m = -2, -2$

$y = (A+Bx)e^{-2x}$ **(Option (B))**

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