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Case 7: When Q is any other function of x (General Method)

Resolve $f(D)$ into linear factors. Let $f(D)=(D-m_1)(D-m_2)\ldots(D-m_n)$

Then for P.I. use

$$\frac{Q}{D-\alpha}=e^{\alpha x}\int e^{-\alpha x}Q\,dx \quad \& \quad \frac{Q}{D+\alpha}=e^{-\alpha x}\int e^{\alpha x}Q\,dx$$

Note: We can find particular integral by this following method

$$f(D) = Q \Rightarrow (D - m_1)(D - m_2)y = Q \quad ...(1)$$

Step – 1 : Put $(D - m_2)y = u$ ...(2)

then (1) becomes $(D - m_1)u = Q$

find value of u by FOFD linear DE

Step – 2 : Put value of u in (2)

then we get value of y

which is particular integral

Q1. A particular integral of the differential equation $y'' + 3y' + 2y = e^{e^x}$ is

(a) $e^{e^x} e^{-x}$

(b) $e^{e^x} e^{-2x}$

(c) $e^{e^x} e^{2x}$

(d) $e^{e^x} e^{x}$

Q2. Solve $\left(D^2-3D+2\right)y=\sin\left(e^{-x}\right)$

(a) $y=c_1e^x+c_2e^{2x}-e^x\sin\left(e^{-x}\right)$

(b) $y=c_1e^x+c_2e^{2x}-e^{-2x}\sin\left(e^{-x}\right)$

(c) $y=c_1e^x+c_2e^{2x}+e^{-2x}\sec\left(e^{-x}\right)$

(d) $y=c_1e^x+c_2e^{2x}-e^{-2x}\sin\left(e^{2x}\right)$

Q3. The solution of differential equation $\frac{d^2y}{dx^2} - y = e^x$ satisfying $y(0) = 0$ & $\frac{dy}{dx}(0) = \frac{3}{2}$ is

(a) $y(x) = \sinh x + \frac{x}{2}e^x$

(b) $y(x) = x\cosh x + \frac{x}{2}e^x$

(c) $y(x) = \sinh x - \frac{x}{2}e^x$

(d) $y(x) = 2x\cosh x - \frac{x}{2}e^x$

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Q.4. A particular integral of $\frac{d^2y}{dx^2}-(a+b)\frac{dy}{dx}+aby=Q(x)$ is

(a) $e^{ax}\{\int e^{(a-b)x}\int Qe^{bx}dx\}dx$

(b) $e^{ax}\{\int e^{(b-a)x}\int Qe^{-bx}dx\}dx$

(c) $e^{-ax}\{\int e^{(b-a)x}\int Qe^{bx}dx\}dx$

(d) None of these

Q.5. Consider the differential equation

$$y'' + ay' + y = \sin x \text{ for } x \in R \qquad (**).$$

Then which one of the following is true ?**IIT JAM 2022**

(a) If $a = 0$, then all the solutions of (**) are unbounded over R.

(b) If $a = 1$, then all the solutions of (**) are unbounded over $(0, \infty)$.

(c) If $a = 1$, then all the solutions of (**) tend to zero as $x \to \infty$

(d) If $a = 2$, then all the solutions of (**) are bounded over $(-\infty, 0)$

Q.6. The real valued function $y(x)$ defined on R is said to be periodic if there exists a real number T > 0 such that $y(x+T) = y(x)$ for all $x \in$ R. Consider the differential equation $\frac{d^2y}{dx^2} + 4y = \sin ax,\ x \in (R,)$ (*)**IIT JAM 2022**

where $a \in R$ is a constant. Then Which of the following is are true ?

(a) All solutions of (*) are periodic for every choice of a.

(b) All solutions of (*) are periodic for every choice of $a \in R - \{-2,2\}$

(c) All solutions of (*) are periodic for every choice of $a \in Q - \{-2,2\}$

(d) $a \in R - Q$ Then there is a unique periodic solution of (*)


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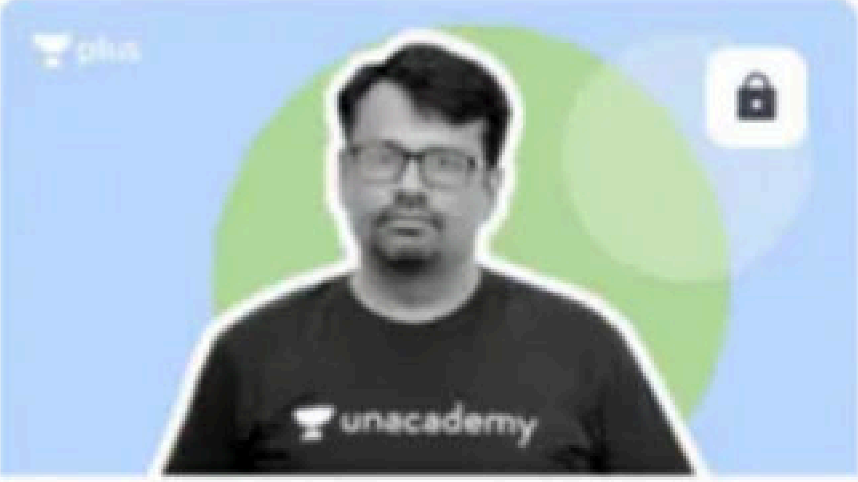

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Educator highlights

- Works at **Pacific Science College**
- Studied at **M.Sc., NET, PhD(Algebra), MBA(Finance), BEd**
- PhD, NET | Plus Educator For CSIR NET | Youtuber (260K+Subs.) | Director Pacific Science College |
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