

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE

Year & Sem – I Year & II Sem Subject – Engineering Mathematics-II Unit – III Presented by – (Dr. Vishal Saxena, Associate Professor)





VISION AND MISSION OF INSTITUTE

VISION OF INSTITUTE

To became a renowned centre of outcome based learning and work towards academic professional, cultural and social enrichment of the lives of individuals and communities.

MISSION OF INSTITUTE

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- Identify based on informed perception of Indian, regional and global needs, the area of focus and provide platform to gain knowledge and solutions.
- Offer opportunities for interaction between academic and industry .
- Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders may emerge.

CONTENTS (TO BE COVERED)

Particular Integral case -1

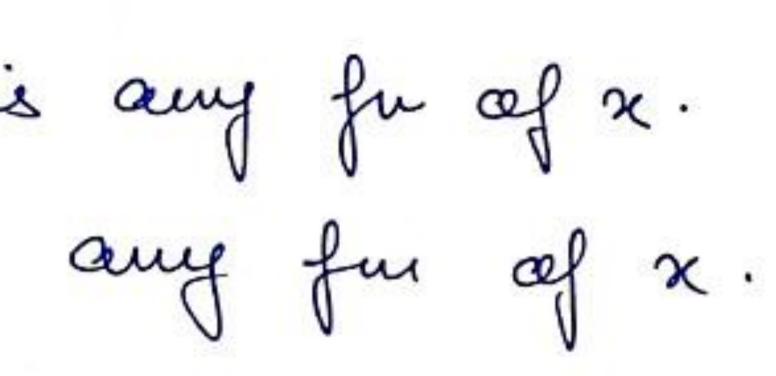
Dr. Vishal Saxena (Associate Professor, Deptt. of Mathematics), JECRC, JAIPUR

RED) se -1

Rules for Finding Particular Subegral (P.I) Consider the equ of (D) y = X P.I is given as P.I = 1 . X J(D) Nou me mill find P.I with different situations given for X as

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1. eax 2. Sujar or Cosar $3 \cdot x^n$; $n \in N$ 4. ear.v; vis any fu of x. 5. XV : v is

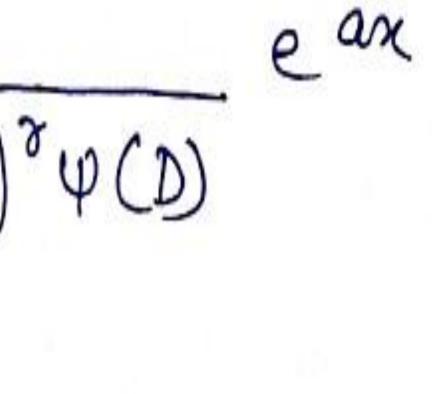


when X = ean P.I. 1(a) $P \cdot I = \int e^{\alpha} f(D)$ eax; f(a) = 0 of f(a) = 0, then (D-a)" exists as a factor

of f(D). i.e $if (D) = (D - a)^{r} \psi(D)$

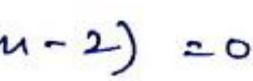
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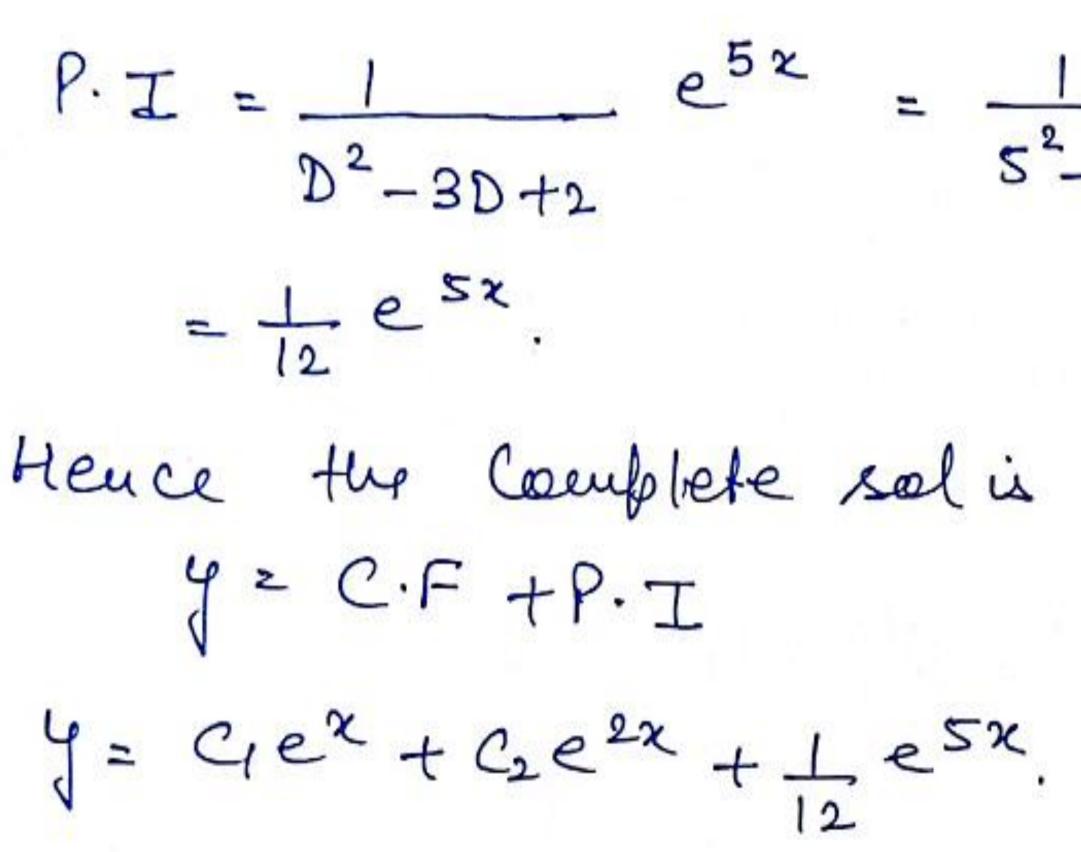
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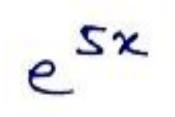


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 $e_{X}: Seelve \frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + 2y = e^{5\chi}$ Sel: gruen egn can be centler as (D2-3D+2) y = e5x The auxilliary equ is $m^2 - 8m + 2 = 0 \Rightarrow (m-1)(m-2) = 0$ m=1,2 C.F c Clex + C2 e2x

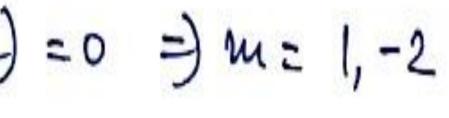


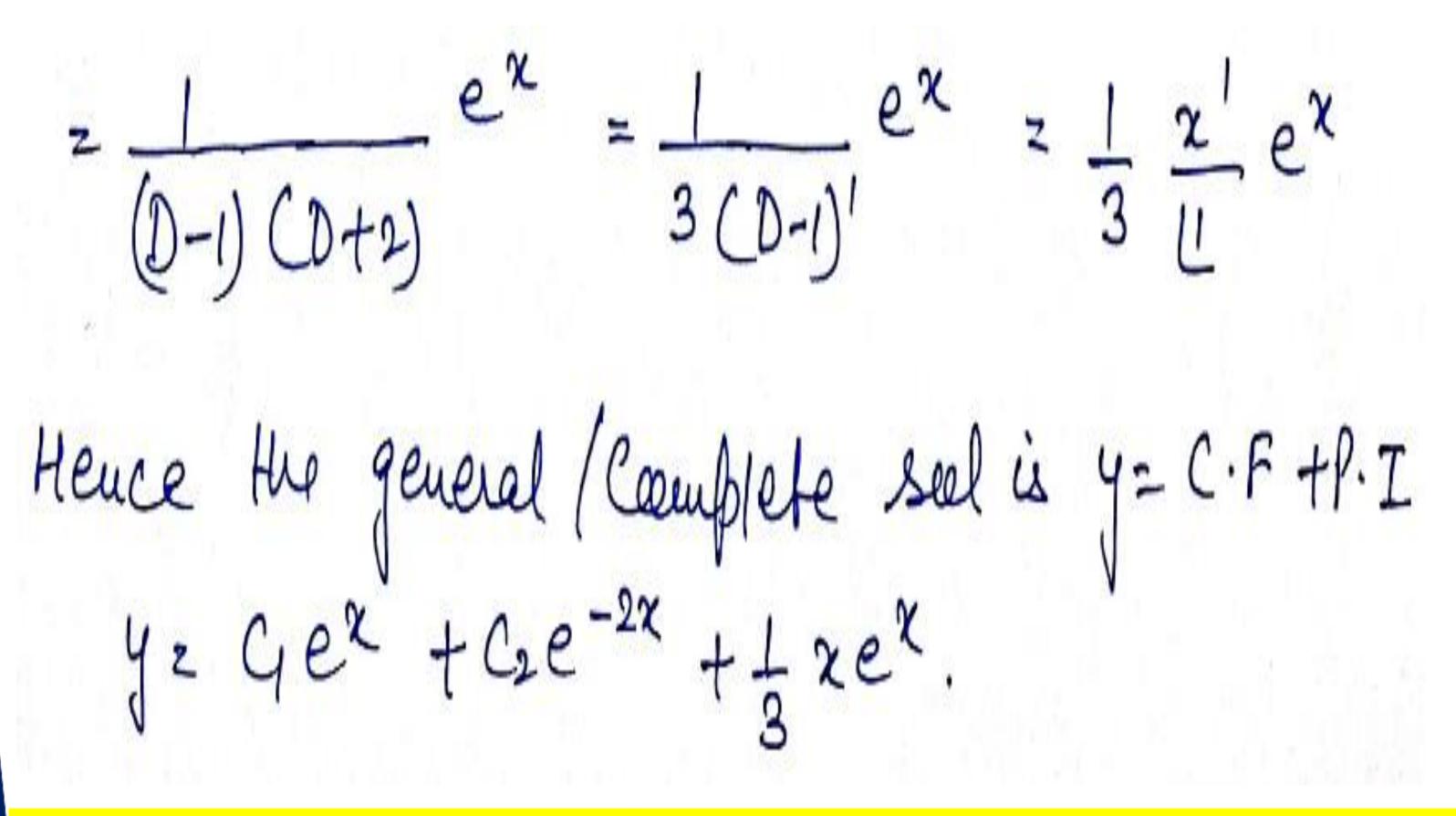




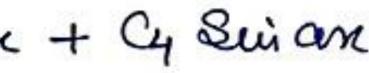
52-3x5+2

 e_X : Solue $(D^2 + D^{-2})y = e^{\chi}$ Sol: The ausielliary eqn is $m^2 + m - 2 = 0 = (m - i)(m + 2) = 0 = m = 1, -2$ C.F= Gex+Ge=2x (!!(a)zo)er $(D^2 + D - 2)$

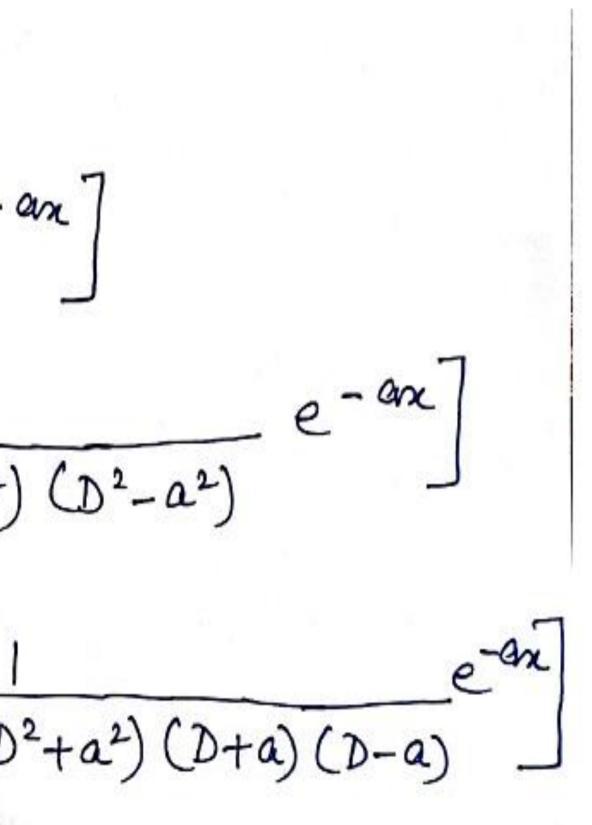




Ex: dry - ary = Coshax $(D^{4} - a^{4})y = (\frac{e^{ax} + e^{-ax}}{2}); D = \frac{d}{dx}$ Sal: To find C.F. the auxiliary equ in m is $m^4 - a^4 = 0$ (m2+a2) (m2-a2)=0 $m = a, -a, \pm ai$ Clean + C2e - an + C3 Cosan + C4 Suian C·F =



ean te P.I -a4 3 (D4-a4) 2 $(D^2 + a^2)(D^2 - a^2)$ ル (D2+a2) 2 a^2)(D+a)(D-a) $(D^2 + \alpha)$ 2



an ヨ -a) 3 2 ~ ~ E ~ 3 403 2 ax 2

hence the Complete sol is Y= C.F +P.I + Ge-an + C3 Cosan + Cy Siman + 4=Ge

x Sin

 $e_{X_1} [(D_{-1})^2 (D^2 + D^2)] y = e^{X}, i D = d_X$ Sel: The auxilliary $(m-1)^2 (m^2+1)^2 = 0$ Rgn is m=1,1, ±i, ±i $C \cdot F = (G + C_2 x)e^{x} + (C_3 + C_4 x)C_{05x} + (C_5 + C_6 x)Suix.$

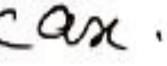


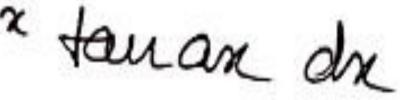
P.I = × $(D-1)^2 (D^2+1)^2$ (D-1)2[12+1]2 4 (D-1)2 $= \frac{1}{4} \cdot \frac{\chi^2}{12} e^{\chi}$ = t x2ex required sol is C.F +P.I.

ex

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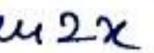
Special Case. Q(x) is tan an/secan. When Then use find P.I by $1 + \tan \alpha x = e^{\alpha x} \int e^{-\alpha x} \tan \alpha x dx$

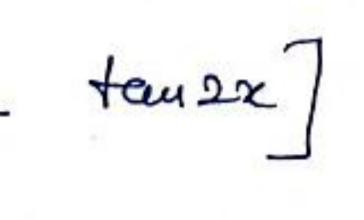




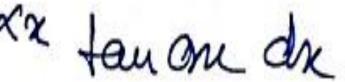
Ex: Salue dry + 44 = tauex Sal: The auxiliary equis $m^2 + 4 = 0 \implies m^2 = -4$ m= ± ei C.F = Gloszx + C2 Sinex

P.J tay 2x D^2+4 ten 22 (D+2i) (D-2i) tau 2x Dtei -D-2i - (D-2i) tay 2x 41 D-(-2i)





Now using 1_____ toware = experx tanon dr = <u>l</u> [e^{six} [e^{-six} tauex dr - e^{-six} [e^{six} tauex dr] = 1 [eriz] (Cosex-i Suizz) tauez de - e-riz (Cossex + i Seirez) tous 2 dx]



 $= \frac{1}{4i} \left[e^{2ix} \left(\frac{\sin 2x}{\sin 2x} - i \frac{\sin^2 2x}{\cos 2x} \right) dx \right]$ - e-rix (Sinex + i Sinex) dr]

 $= \frac{1}{4i} \left[e^{2ix} \left(-\frac{\cos 2x}{2} \right) - i e^{2ix} \right] \left(\frac{1 - \cos^2 2x}{\cos 2x} \right) dx$ $+e^{-\lambda i \chi} \left(\frac{\cos 2\chi}{2} \right) - i e^{-\lambda i \chi} \int \left(\frac{1 - \cos^2 2\chi}{\cos 2\chi} \right) d\chi$

 $= \frac{1}{4i} \left[-\cos 2x \left(\frac{e^{2ix} - e^{-2ix}}{2} \right) - i \left(e^{2ix} + e^{-2ix} \right) \right] \left(\sec 2x - \cos 2x \right) dn$

 $= \frac{1}{4i} \left[-i \cos 2x \sin 2x - 2i \cos 2x \left[\log \left(\sec 2x + \tan 2x \right) - \frac{\sin 2x}{2} \right] \right]$

= -1 Cos2x Suiex -1 Cos2x log (Sec2x + teenen) + 1 Cosex Seinex = - 1 Coser log (Secerttaner)

hence the general sal is $Y = C \cdot F + P \cdot I$ y = G Cosex + C2 Suiex - 4 Cosex log (Secent tanen).

Ex: dry + ary = sec an the auxilliary equis $(m^2 + a^2) = 0 \implies m = \pm ai$ Sal! C1 Cosax + C2 Suiax $C \cdot F =$ $P \cdot T = \frac{1}{D^2 + a^2}$ Sec ax 1 [D-ai] - [Jsecan 2ai [(D-ai)] - (Dtai)] Secan Dr. Vishal Saxena (Associate Professor, Deptt. of

Mathematics), JECRC, JAIPUR



Now using _____ Secar = e^{kx} [e^{-ix} secardx (D-ai) Now 1 Secar = eion f e-ion sec an ch = eian J (Cosan-isiian) dr Cosan (1-itanax) dr = e iax [x+i log (Cosax)] ze ian

Similarly (D+ai) Secar = e-aix[x-i leg(cesar)] Thus P.I = 1 [eian { x+ ai log (Cosan)} dia [eian { x+ ai log (Cosan)} -e-ian { x - i log (Cosan) {] $= \frac{\chi}{\lambda ia} \left(e^{iax} - e^{-iax} \right) + \frac{1}{a^2} leg \left(cosax \right) \left(\frac{e^{iax} + e^{-iax}}{2} \right)$

= x Suian + 1 Cosan. Leg (Cosan) a² hence the complete selic $y = C \cdot F + P \cdot I$. y = G Casar + G Seijar + 1 Casar. Leg (Casar).

Practice Problems $\frac{1}{dx^{3}} - \frac{y}{dx^{3}} = (1 + e^{2})^{2}$ Aus: $y = 4e^{x} + e^{-\frac{x}{2}} \left[2 \cos\left(\frac{\sqrt{3x}}{2}\right) + \frac{\sqrt{3x}}{2} \sin\left(\frac{\sqrt{3x}}{2}\right) \right] - 1 + 2xe^{x} + \frac{e^{x}}{3} + \frac{e^{x}}{$ 2. $\frac{d^2y}{dx^2} + \frac{dy}{dx} + \frac{y}{dx} = e^{-\chi}$ Ans: $g_2 e^{-2t_2} \left[C_1 C_{02} \left(\frac{\sqrt{3x}}{2} \right) + C_2 Sin \left(\frac{\sqrt{3x}}{2} \right) \right] + e^{-x}$

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3.
$$(D^3 + D^2 - D - 1)y = (ashx, D = dx$$

Ans: $y = C_1e^{\chi} + (C_2 + C_3\chi)e^{-\chi} + \frac{1}{8}$
4. $\frac{d^2y}{d\chi^2} + 2\frac{dy}{d\chi} + 2y = Seih\chi$
Ans: $y = e^{-\chi}[C_1 Cos\chi + C_2 Seix] + \frac{1}{8}$
5. $\frac{d^2y}{d\chi^2} + \frac{1}{9} = Cosec\chi$
Ans: $y = C_1 Cos\chi + C_2 Seix - \chi Cos\chi + \frac{1}{8}$

Lxex - Lx2e-x

e-x $t = \frac{e^{\chi}}{10} - \frac{1}{2}$ 2

Seix. leg (Seix)



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