LNCT GROUP OF COLLEGES

Name of Faculty: Dr. Sanjeet Kumar

Designation: Professor & Head

Department: Mathematics

LNCT&S, Bhopal (M.P)

Assignment-2

Subject: Mathematics-II

(BT-202)

(Common to All Branches)

Topic: Ordinary Differential Equation-II

1. Solve the equation $x^2\frac{d^2y}{dx^2}-(2x-1)\frac{dy}{dx}+(x-1)y=e^x$ given that e^x is one integral.
2. Solve the equation $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=0$, given that $x+\frac{1}{x}$ is one integral.
3. Solve by removal of first derivative
   (i) $\frac{d^2y}{dx^2}-2\tan x\frac{dy}{dx}+5y=\sec x.\ e^x$
   (ii) $\frac{d^2y}{dx^2}-4x\frac{dy}{dx}+(4x^2-1)y=-3e^{x^2}.\sin 2x$
4. Solve by change of independent variable
   (i) $\frac{d^2y}{dx^2}+\tan x\frac{dy}{dx}-2\cos^2 x.y=2\cos^4 x$
   (ii) $x\frac{d^2y}{dx^2}-\frac{dy}{dx}-4x^3y=8x^3.\sin(x^2)$
5. Apply the method of variation of parameters to solve
   (i) $\frac{d^2y}{dx^2}+4y=4\tan 2x$ (ii) $\frac{d^2y}{dx^2}+a^2y=\sec ax$ (iii) $\frac{d^2y}{dx^2}+a^2y=\operatorname{cosec} ax$

6. Solve in series of the following equation when $x=0$ is a ordinary point

 (i) $\left(1+x^2\right)\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}-y=0$

 (ii) $\left(1-x^2\right)\dfrac{d^2y}{dx^2}+2x\dfrac{dy}{dx}+y=0$

 (iii) $\left(1-x^2\right)\dfrac{d^2y}{dx^2}-2x\dfrac{dy}{dx}+n(n+1)y=0$

7. Solve in series of the following equation when $x=0$ is a Regular singular point

 (i) $2x^2\dfrac{d^2y}{dx^2}+\left(2x^2-x\right)\dfrac{dy}{dx}+y=0$

 (ii) $x\dfrac{d^2y}{dx^2}+\dfrac{dy}{dx}+\left(x^2-n^2\right)y=0$

8. Prove That

 (i) $P_n(-x)=(-1)^n.P_n(x)$

 (ii) $J_{\frac{1}{2}}(x)=\sqrt{\dfrac{2}{\pi x}}\ \sin x$

 (iii) $J_{\frac{3}{2}}(x)=\sqrt{\dfrac{2}{\pi x}}\left(\dfrac{\sin x}{x}-\cos x\right)$

9. Express $f(x)=x^4+3x^3-x^2+5x-2$ in terms of Legendre Polynomials.

10. Show that:

 (i) $P_n(-1)=(-1)^n$

 (ii) $P_n^{'}(1)=\dfrac{1}{2}n(n+1)$

-----------------xxxxx---------------