QUESTIONS Sheet on Differential Equations

1.The order and degree of the differential equation $y + \frac{dy}{dx} = \frac{1}{4}\int y.dx$ are

(a)order=2 and degree=1

(b)order=1 and degree=2

(c)order=1 and degree=1

(d)order=2 and degree=2

ANS:-(a)

2.solve $(x+1)\frac{dy}{dx}=2xy$.

(a)log=log(y+1)+C

(b)logy=$\frac{1}{x+1}$

(c)logy=2$[x - logIx + 1I]$ +C

(d)$\frac{y}{x}$=C

ANS:- (c)

3.Solve $x\frac{dy}{dx}=y-x\tan\left[\frac{y}{x}\right]$

(a)l$\cos\frac{x}{y}$l=lxcl

(b)l$\sin\frac{y}{x}$l=l$\frac{c}{x}$l

(c)l$\sin\frac{y}{x}$l=lycl

(d)l$\sec\frac{x}{y}$l=l$\frac{c}{y}$l

ANS:- (b)

4.Solve $\frac{dy}{dx}$+ysecx=tanx

(a)y(secx+tanx)=secx+tanx-x+c

(b)ytanx=secx+x+c

(c)y(cosecx+cotx)=cosecx+cotx-x+c

(d)ylogsecx=tanx+c

ANS:- (a)

5.Solve $cos^2 x\frac{dy}{dx}$+y=tanx

(a)ye^{tanx}=cosxtanx+c

(b) $ye^{tanx} = e^{tanx}$tanx+c

(c) $ye^{tanx} = (tanx - 1) + c$

(d) $ye^{tanx} = e^{tanx}(tanx - 1) + c$

ANS:- (d)

6.Solve (x^2-2xy-y^2)dx-$(x - y)^2$dy=0

(a)$\frac{x^3}{3}$-x^2y - y^2-x^2

(b)3x^2-$y^2x - x^2$-$\frac{y^3}{3} = c$

(c) $\frac{x^3}{3} - x^2y - \frac{y^2}{2}$=c

(d) $\frac{x^3}{3} - x^2y - y^2x - \frac{y^3}{3}$=c

ANS:- (d)

7.Solve $(y^2 + e^{xy^2} + 4x^3)dx + (2xye^{xy^2}-3y^2)dy = 0$

(a) e^{xy^2}+$\frac{x^4}{y^3}$=c (b) $e^{xy^2} + x^4 - y^3 = c$

(c) $e^{xy^2} + xy^2 = c$ $(d)e^{xy^2} + x^3 + y^4$=c

ANS:- (b)

8.Solve $\frac{dy}{dx}$=cos(y-$\frac{xdy}{dx}$)

(a)x=c^2+cosc (b)y=c(x-1)-coscx

(c)y=cx+$cos^{-1}c$ $(d)y = cos^{-1}x$

ANS:-(c)

9.Solve $9y'' + 6y' + y = 0\ for\ y(0) = 4 \quad and\ y'(0)$=-1/3

(a)y=(4+x) $e^{\frac{-x}{3}}$ (b)y=(4-x)) $e^{\frac{-x}{3}}$

(c)y=(8-2x) $e^{\frac{x}{3}}$ (d)y=(1-x) $e^{\frac{-x}{3}}$

ANS:- (a)

10.Solve $2y''$-$4y'$+8y=0

(a)y= e^{x}(Asin$\sqrt{3}$x-Bcos$\sqrt{3}$x)

(b) y= e^{x}(Acos$\sqrt{3}$x+Bsin$\sqrt{3}$x)

(c) y= e^{-x}(Asin$\sqrt{3}$x+Bsin$\sqrt{3}$x)

(d) y= e^{x}(Acos$\sqrt{3}$x-Bsin$\sqrt{3}$x)

ANS:- (b)

11.Solve $y'' - 16y = 0$

(a)y=(c_1+c_2) e^{4x} (b) y=(c_1+c_2) e^{-4x}

(c)y=$c_1e^{4x} - c_2e^{-4x}$ (d) y=$c_1e^{4x} + c_2e^{-4x}$

ANS:- (d)

12. Solve $y'' - y = 0$

(a) y=$c_1e^{x} - c_2e^{x}$ (b)y=$c_1(e^{x} + e^{-x})$

(c)$y = c_1e^{x} + c_2e^{x}$ (d) y=$c_1e^{x} - c_2e^{-x}$

ANS:- (c)

13.Solve $\frac{d^2y}{dx^2}$+2$\frac{dy}{dx}$+y=e^{-4x}

(a)y=(Ax+B) e^{-4x}+e^{-4x}

(b) y=(Ax+B) $e^{-4x} + \frac{e^{-4x}}{9}$

(c) y=(Ax+B) $e^{-2x} + \frac{e^{-2x}}{9}$

(d) y=(Ax+B) e^{4x}+e^{4x}

ANS:- (b)

14.Solve $\left(\frac{d^2y}{dx^2}+4\right)y=cos2x$

(a)y=Acos2x+Bsin2x+$\frac{x}{4}sin2x$

(b)y=Acos2x+Bsin2x

(c)y=$\frac{x}{4}$sin2x

(d)y=Acos2x+Bsin2x-$\frac{x}{4}$sin2x

ANS:- (a)

15.Solve (D^2-5D+6)y=e^xcos2x

(a)y=c_1e^{2x}+c_2e^{3x}+$\frac{e^x}{20}$(3sin2x+cos2x)

(b) y=c_1e^{2x}+c_2e^{3x}-$\frac{e^x}{20}$

(c) y=c_1e^{2x}+c_2e^{3x}-$\frac{e^x}{20}$(3cos2x-sin2x)

(d) y=c_1e^{2x}+c_2e^{3x}-$\frac{e^x}{20}$(3sin2x+cos2x)

ANS:- (d)

16.The solution of the differential equation $\frac{dy}{dx}+y^2=0\ is$

(a)y=$\frac{1}{x+c}$

(b)y=$\frac{-x^3}{3}$+c

(c)ce^x

(d)Unsolvable as equation is non-linear.

ANS:- (a)

17.Biotransformation of an organic compound having concentration (x) can be modelled using an ordinary differential equation $\frac{dx}{dt}$+kx^2=0 ,where k is the reaction rate constant. If x=a at t=0, the solution of the equation is

(a)x=ae^{-kt} (b)$\frac{1}{x}$=$\frac{1}{a}$+kt

(c)x=a(1-e^{-kt}) (d)x=ask

ANS:- (b)

18. The solution of the first –order differential equation $x'(t)$=-3x(t),x(0)=x_0 is

(a)x(t)=$x_{0=}x_0$ e^{-3t} (b) x(t)=x_0 e^{-3}

(c)x(t)= x_0 $e^{-\frac{1}{3}}$ (d)x(t)= x_0 e^{-1}

ANS:- (a)

19.The solution of the following differential equation is given by

$\frac{d^2y}{dx^2}$-5$\frac{dy}{dx}$+6y=0

(a)y=e^{2x}+e^{-3x} (b) y=e^{2x}+e^{3x}

(c) y=e^{-2x}+e^{-3x} (d)y=e^{-2x}+e^{-3x}

ANS:- (b)

20.The solution of $\frac{d^2y}{dx^2}$-5$\frac{dy}{dx}$+17y=0; y(0)=1; $\frac{dy}{dx}(\frac{\pi}{4})$=0 in the range 0<x<$\frac{\pi}{4}$ is given by

(a) $e^{-x}\left(cos4x+\frac{1}{4}sin4x\right)$

(b) $e^{x}\left(cos4x-\frac{1}{4}sin4x\right)$

(c) $e^{-4x}\left(cos4x-\frac{1}{4}sin4x\right)$

(d) $e^{-4x}\left(cos4x-\frac{1}{4}sin4x\right)$

ANS:- (a)

21.Transformation to the linear form by substituting v=y^{1-n} to the equation $\frac{dy}{dt}$+p(t)y=q(t)y^n; n>0 will be

(a)$\frac{dv}{dt}$+(1-n)pv=(1-n)q

(b) $\frac{dv}{dt}$+(1-n)pv=(1+n)q

(c) $\frac{dv}{dt}$+(1+n)pv=(1-n)q

(d) $\frac{dv}{dt}$+(1+n)pv=(1+n)q

ANS:- (a)

22.The solution of the differential equation $\frac{dy}{dx}$+2xy=e^{-x^2} with y(0)=1 is

(a)(1+x)e^{x^2} (b) (1+x)e^{-x^2}

(c) (1-x)e^{x^2} (d) (1+x)e^{-x^2}

ANS:- (b)

23. A spherical naphthalene ball exposed to the atmosphere loss volume at a rate proportional to its instantaneous surface area due to evaporation.If the initial diameter of the ball is 2cm and the diameter reduces to 1 cm after 3 months , the ball completely evaporates in ,

(a)6 months (b)9 months

(c)12 months (d)infinite time

ANS:- (a)

24.The solution for the differential equation $\frac{dy}{dx}$=x^2y with the condition that y=1 at x=0 is

(a)y=$e^{\frac{1}{2x}}$ (b)ln(y)=$\frac{x^3}{3}$+4

(c)ln(y)=$\frac{x^2}{2}$ (d)y=$e^{\frac{x^3}{3}}$

ANS:- (d)

25.A body originally at 60℃ cool down to 40 ℃ in 15 minutes when kept in air at a temperature of 25℃ .What will be temperature of the body at the end of 30 minutes?

(a)35.2℃ (b)31.5℃

(c)28.7℃ (d)15℃

ANS:- (b)

26.The solution of $\frac{dy}{dx}$=y^2 with initial value y(0)=1 bounded in the interval is,

(a)$-\infty \leq x \leq \infty$ (b) $-\infty \leq x \leq 1$

(c) x<1 ,x>1 (d) $-2 \leq x \leq 2$

ANS:- (c)

27. The solution of the differential equation $3y\frac{dy}{dx}+2x=0$ represents a family of

(a)ellipse (b)circle

(c)parabola (d)hyperbola

ANS:-(a)

28.A function n(x) satisfies the differential equation $\frac{d^2n(x)}{dx^2}-\frac{n(x)}{L^2}=0$,Where L is constant .The boundary conditions are n(0)=k and n(∞) =0 .The solution to this equation is,

(a) $n(x)=k\exp(\frac{x}{L})$ (b) $n(x)=k\exp(\frac{-x}{\sqrt{L}})$

(c) $n(x)=k^2\exp(-\frac{x}{L})$ (d)) $n(x)=k\exp(-\frac{x}{L})$

ANS:-(d)

28.The order and degree of differential equation $\frac{d^3y}{dx^3}+4\sqrt{(\frac{dy}{dx})^3}+y^2=0$ are, respectively,

(a)3 and 2 (b) 2 and 3

(c) 3 and 3 (d) 3 and 1

ANS:-(a)