CHAPTER - 19
Differential Equations

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1 MCQ's with One Correct Answer

1) The differential equation whose solution is $Ax^2 + By^2 = 1$ where A and B are arbitrary constants is of

a) second order and second degree
b) first order and second degree
c) first order and first degree
d) second order and first degree

[2006]

2) The differential equations of all the circles passing through the origin and having their centres on x-axis is

a) $y^2 = x^2 + 2xy\frac{dy}{dx}$
b) $y^2 = x^2 - 2xy\frac{dy}{dx}$
c) $x^2 = y^2 + xy\frac{dy}{dx}$
d) $x^2 = y^2 + 3xy\frac{dy}{dx}$

[2007]

3) The solution of the differential equation $\frac{dy}{dx} = \frac{x+y}{x}$ satisfying the condition $y(1) = 1$ is

a) $y = \ln x + x$
b) $y = x \ln x + x^2$
c) $y = xe^{(x-1)}$
d) $y = x \ln x + x$

[2008]

4) The differential equation which represents the family of curves $y = c_1 e^{c_2} x$, where c_1 and c_2 are arbitrary constants, is

a) $\frac{d^2y}{dx^2} = y\frac{dy}{dx}$
b) $y\frac{d^2y}{dx^2} = \frac{dy}{dx}$
c) $y\frac{d^2y}{dx^2} = \left(\frac{dy}{dx}\right)^2$
d) $\frac{dy}{dx} = y^2$

[2009]

5) Solutions of the differential equation $\cos x dy = y(\sin x - y)dx, 0 < x < \frac{\pi}{2}$ is

a) $y \sec x = \tan x + c$
b) $y \tan x = \sec x + c$
c) $\tan x = (\sec x + c)y$
d) $\sec x = (\tan x + c)y$

[2010]

6) If $\frac{d^2y}{dx^2} = y + 3$ and $y(0) = 2$, then $y(\ln 2)$ is equal to:

a) 5
b) 13
c) -2
d) 7.

[2011]

7) Let be the purchase value of an equipment and $V(t)$ be the value after it has been used for t years. The value V(t) depreciates at a rate given by differential equation $\frac{dV_{(t)}}{dt}$=-k($T-t$). where k is a constant and T is the total life in years of the equipment. Then the scrap value $V(T)$ of the equipment is

a) $l-\frac{kT^2}{2}$
b) $l-\frac{k(T-t)^2}{2}$
c) e^{-kT}
d) $T^2-\frac{1}{k}$

[2011]

8) The population $p(t)$ at time of a certain mouse species satisfies the differential equation $\frac{dp(t)}{dt}=0.5p(t)-450$. If $p(0)=850$,then the time at which the population becomes zero is:

a) $2\ln 18$
b) $2\ln 9$
c) $\frac{1}{2}\ln 18$

[2012]

9) At present, a firm is manufacturing 2000 times. It is estimated that the rate of change of production P with respect to additional number of workers x is given by $\frac{dP}{dx}=100-12\sqrt{x}$. If the firm employs 25 more workers, then the new level of production of items is

a) 2500
b) 3000
c) 3500
d) 4500

[JEE M 2013]

10) Let the population of rabbits surviving at time t be governed by the differential equation $\frac{dp(t)}{dt}=\frac{1}{2}p(t)-200$. If P(0)=100, then p($t$) equals:

a) $600-500e^{\frac{t}{2}}$
b) $400-300e^{\frac{-t}{2}}$
c) $400-300e^{\frac{t}{2}}$
d) $300-200e^{\frac{-t}{2}}$

[JEE M 2014]

11) Let $y(x)$ be the solution of the differential equation $(x\log x)\frac{dy}{dx}+y=2x\log x,(x\geq 1)$. Then $y(e)$ is equal to:

a) 2
b) $2e$
c) e
d) 0

[JEE M 2015]

12) If the curve $y=f(x)$ passes through the point $(1,1)$ and satisfies the differential equation, $y(1+xy)\,dx=xdy$, then $f\left(\frac{-1}{2}\right)$ is equals to

a) $\frac{2}{5}$
b) $\frac{4}{5}$
c) $\frac{2}{5}$
d) $\frac{4}{5}$

[JEE M 2016]

13) If $(24\sin x)\frac{dy}{dx} + (y+1)\cos x = 0$ and $y(0) = 1$ then $y\left(\frac{\pi}{2}\right)$ is equal to

a) $\frac{4}{3}$
b) $\frac{1}{3}$
c) $\frac{2}{3}$
d) $\frac{1}{3}$

[JEE M 2017]

14) Let $y = y(x)$ be the solution of the differential equation $\sin x\frac{dy}{dx} + y\cos x = 4x$, $x \in (0,2)$. If $y\left(\frac{\pi}{2}\right) = 0$, then $y\left(\frac{\pi}{6}\right)$ is equal to

a) $\frac{-8}{9\sqrt{3}}\pi^2$
b) $\frac{-8}{9}\pi^2$
c) $\frac{-4}{9}\pi^2$
d) $\frac{4}{9\sqrt{3}}\pi^2$

[JEE M 2018]

15) If $y = y(x)$ is the differential equation $\sin x\frac{dy}{dx} + 2y = x^2$ satisfying $y(a) = 1$,then $y\left(\frac{1}{2}\right)$ is equal to

a) $\frac{7}{64}$
b) $\frac{1}{4}$
c) $\frac{49}{16}$
d) $\frac{13}{16}$

[JEE M 2019-9April(M)]

16) The solution of the differential equation $x\frac{dy}{dx} + 2y = x^2\,(x \neq 0)$with$y(1) = 1$, is:

a) $y = \frac{4}{5}x^3 + \frac{1}{5x^2}$
b) $y = \frac{x^3}{5} + \frac{1}{5x^2}$
c) $y = \frac{x^2}{4} + \frac{3}{4x^2}$
d) $y = \frac{3}{4}x^2 + \frac{1}{4x^2}$

[JEE M 2019-9April(M)]