PRACTICE QUESTIONS FOR COMPETITIVE EXAMINATIONS
SUB: MATHEMATICS
TOPIC: DIFFERENTIAL EQUATIONS

1. The order and degree of the differential equation $\sqrt[3]{\frac{dy}{dx}}-4\frac{d^2y}{dx^2}-7x=0$ are a and b, then $a+b$ is:
(A) 3 (B) 4 (C) 5 (D) 6

2. A solution of the differential equation $\left(\frac{dy}{dx}\right)^2-x\frac{dy}{dx}+y=0$ is
(A) $y=2$ (B) $y=2x$ (C) $y=2x-4$ (D) $y=2x^2-4$

3. The solution of the differential equation $e^x(x+1)dx+(ye^y-xe^x)dy=0$, with initial condition $f(0)=0$, is
(A) $xe^x+2y^2e^y=0$ (B) $2xe^x+y^2e^y=0$ (C) $xe^x-2y^2e^y=0$ (D) $2xe^x-y^2e^y=0$

4. The equation of the curve passing through the origin and satisfying the differential equation $\frac{dy}{dx}=sin(10x+6y)$ is
(A) $y=\frac{1}{3}tan^{-1}\left(\frac{5\tan 4x}{4-3tan4x}\right)-\frac{5x}{3}$ (B) $y=\frac{1}{3}tan^{-1}\left(\frac{5\tan 4x}{4+3tan4x}\right)-\frac{5x}{3}$
(C) $y=\frac{1}{3}tan^{-1}\left(\frac{3+tan4x}{4-3tan4x}\right)-\frac{5x}{3}$ (D) none

5. The solution of $y^5x+y-x\frac{dy}{dx}=0$ is
(A) $\frac{x^4}{4}-\frac{1}{5}\left(\frac{x}{y}\right)^5=C$ (B) $\frac{x^5}{5}+\frac{1}{4}\left(\frac{x}{y}\right)^4=C$ (C) $\frac{x^4}{4}+\left(\frac{x}{y}\right)^5=C$ (D) $\frac{x^5}{5}+(xy)^4=C$

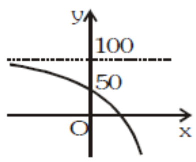
6. The solution of the differential equation $(2x-10y^3)\frac{dy}{dx}+y=0$ is
(A) $x+y=ce^{2x}$ (B) $y^2=2x^3+c$ (C) $xy^2=2y^5+c$ (D) $x(y^2+xy)=0$

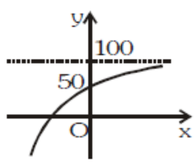
7. The degree and order of the differential equation of the family of all parabolas whose axis is X-axis, are respectively
(A) 2, 1 (B) 1, 2 (C) 3, 2 (D) 2, 3

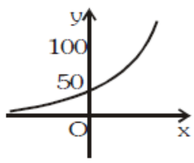
8. The differential equation of the family of curves represented by $y=a+bx+ce^{-x}$ (where a, a, a are arbitrary constants) is
(A) $y'''=y'$ (B) $y'''+y''=0$ (C) $y'''-y''+y'=0$ (D) $y'''+y''-y'=0$

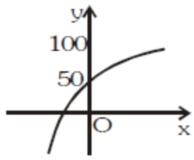
9. The solution of the differential equation $y\,dx+(x+x^2y)dy=0$ is
(A) $\frac{1}{xy}+logy=c$ (B) $logy=cx$ (C) $\frac{-1}{xy}=c$ (D) $\frac{-1}{xy}+logy=c$

10. Which one of the following curves represents the solution of the initial value problem $Dy=100-y$, where $y(0)=50$.

(A)


(B)


(C)


(D)


11. The solution of $\frac{xdy}{x^2+y^2}=\left(\frac{y}{x^2+y^2}-1\right)dx$ is
(A) $y=x\,cot(c-x)$ (B) $cos^{-1}\frac{y}{x}=-x+c$ (C) $y=x\,tan(c-x)$
(D) $\frac{y^2}{x^2}=x\,tan(c-x)$

12. The solution of the differential equation $(2x - 10y^3)\frac{dy}{dx} + y = 0$ is
(A) $x + y = ce^{2x}$ (B) $y^2 = 2x^3 + c$ (C) $xy^2 = 2y^5 + c$ (D) $x(y^2 + xy) = 0$

13. If $y = e^{(k+1)x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 0$, then $k =$
(A) -1 (B) 0 (C) 1 (D) 2

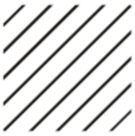
14. A curve passes through the point $\left(1, \frac{\pi}{4}\right)$ & its slope at any point is given by $\frac{y}{x} - cos^2\left(\frac{y}{x}\right)$. Then the curve has the equation
(A) $y = x\, tan^{-1}\left(ln\frac{e}{x}\right)$ (B) $y = x\, tan^{-1}(ln + 2)$ (C) $y = \frac{1}{x}\, tan^{-1}\left(ln\frac{e}{x}\right)$
(D) none

15. Solution of differential equation $(1 + y^2)dx + \left(x - e^{tan^{-1}y}\right)dy = 0$ is
(A) $ye^{tan^{-1}x} = tan^{-1}x + c$ (B) $xe^{tan^{-1}y} = \frac{1}{2}e^{2\,tan^{-1}y} + c$
(C) $2x = e^{tan^{-1}y} + c$ (D) $y = xe^{-tan^{-1}x} + c$

16. A curve passing through (2, 3) and satisfying the differential equation $\int_0^x ty(t)dt = x^2 y(x), (x > 0)$ is
(A) $x^2 + y^2 = 13$ (B) $y^2 = \frac{9}{2}x$ (C) $\frac{x^2}{8} + \frac{y^2}{18} = 1$ (D) $xy = 6$

17. Number of values of $m \in N$ for which $y = e^{mx}$ is a solution of the differential equation $D^3y - 3D^2y - 4Dy + 12y = 0$ is
(A) 0 (B) 1 (C) 2 (D) more than 2

18. The general solution of the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$ is a family of curves which looks most like which of the following?

(A)  (B)  (C)  (D) 

19. The order and degree of the differential equation $\left(1 + 3\frac{dy}{dx}\right)^{2/3} = 4\frac{d^3y}{dx^3}$ are
(A) 1, 2/3 (B) 3, 1 (C) 1, 2 (D) 3, 3

20. The solution to the differential equation $y \ln y + xy' = 0$, where $y(1) = e$ is
(A) $x(\ln y) = 1$ (B) $xy(\ln y) = 1$ (C) $(\ln y)^2 = 2$ (D) $\ln y + \left(\frac{x^2}{2}\right)y = 1$

ANSWERS :
(1) C (2) C (3) B (4) A (5) B (6) C (7) B (8) B (9) D (10) B (11) C
(12) C (13) C (14) A (15) B (16) D (17) C (18) B (19) D (20) A