Unit 3 and Unit 4

ONE MARK QUESTIONS

1. The integrating factor of the differential equation $\frac{dy}{dx}+\frac{y}{x}=y^2x$ is ____________
2. The differential equation$(y^2+2y)\,dx+(xy^3+2y^4-4x)\,dy=0$ is exact. TRUE/FALSE
3. The factors of the differential equation$xyP^2-(x^2+y^2)P+xy=0$ are
   a)$P=\frac{y}{x}$ b) $P=\frac{x}{y}$ c)both (a) and (b) d) None of (a) and (b)
4. What is the differential equation which explains Newton's law of cooling?

TWO MARKS QUESTIONS

5. The integrating factor of $2y\,dx+(2x\,ln\,x-xy)\,dy=0$
   a) $\frac{1}{x}$ b) y c) e^{2y} d) The differential equation is exact
6. The solution of the differential equation $\frac{dy}{dx}=\frac{e^x-sec\,x\,tan\,x\,tan\,y}{sec\,x\,sec^2\,y}$ is __________
7. The orthogonal trajectories of the family of curves $r=a(1+cos\,\theta)$ is
   a) $r=k\,sin\,\theta$ b) $r^2=k\,cos^2\,\theta$ c)$r=k(1-cos\,\theta)$ d) $r=k(1-cos\,\theta)$
8. The General solution of the differential equation $y+Px=p^2x^4$ is
   a)$y+\frac{C}{x}=c^2$ b) $4x^2y+1=0$ c)$x\sqrt{p}=c$ d) None of these

FOUR MARK QUESTIONS

9. The solution of the differential equation $y=xp^2+p$ is __________.
10. A body cools from 75^0C to55^0C in ten minutes when the surrounding temperature is 31^0c. At what average temperature will its rate of cooling be $1\,/\,4^{th}$ that at the start?

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11. The differential equation satisfying $y=Ae^{3x}+Be^{2x}$ is
    a)$\frac{d^2y}{dx^2}-5\frac{dy}{dx}+6y=0$
    b) $\frac{d^2y}{dx^2}+5\frac{dy}{dx}+6y=0$
    c) $\frac{d^2y}{dx^2}+5\frac{dy}{dx}-6y=0$
    d) $\frac{d^2y}{dx^2}-5\frac{dy}{dx}-6y=0$

12. The complimentary function of the differential equation $\frac{d^4y}{dx^4}-2\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}-2\frac{dy}{dx}+y=0$
    Is
    a) $y=(C_1-C_2x)e^x+C_3\,cos\,x+C_4\,sin\,x$
    b) $y=(C_1+C_2x)e^x-C_3\,cos\,x+C_4\,sin\,x$
    c) $y=(C_1+C_2x)e^{-x}+C_3\,cos\,x+C_4\,sin\,x$
    d) $y=(C_1+C_2x)e^{-x}+C_3\,cos\,x+C_4\,sin\,x$
13. The Wronskian of the differential equation $\frac{d^2y}{dx^2}-y=\frac{2}{1+e^x}$ will be
    a) -2 b) -4 c) 4 d)-8
14. A simple mass spring system consist of a mass 'm' suspended from a spring of stiffness 'k'. Considering 'x' as the displacement at any given time 't' the equation of the motion for the free vibration of the system is . The natural frequency of the system is _________.

TWO MARK QUESTIONS

15. The solution of the differential equation $\frac{d^3y}{dx^3} - 9\frac{dy}{dx} = cos\, x$ is

a) $y = C_1e^{3x} + C_2e^{-3x} + C_3 - \frac{1}{10}sin\, x$

b) $y = C_1e^{3x} + C_2e^{-3x} + C_3 + \frac{1}{10}cosx$

c) $y = C_1e^{3x} + C_2e^{-3x} + C_3 - \frac{1}{10}cos\, x$

d) $y = C_1e^{3x} + C_2e^{-3x} + C_3 - \frac{1}{10}sin\, x$

16. The Complimentary function of the differential equation $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 4$ is

a) $y = c_1x^2 + c_1x$ b) $y = \frac{c_1}{x} + c_2x$ c) y= $\frac{c_1}{x} + c_2x^2$ d) None of these

17. The General solution of the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 5y = 0$ is

a) $y = c_1e^{(1+\sqrt{6})x} + c_2e^{(-1-\sqrt{6})x}$

b) $y = c_1e^{(-1+\sqrt{8})x} + c_2e^{(-1-\sqrt{8})x}$

c) $y = c_1e^{(-2+\sqrt{6})x} + c_2e^{(-2-\sqrt{6})x}$

d) $y = c_1e^{(-2+\sqrt{8})x} + c_2e^{(-2-\sqrt{8})x}$

18. A solution of the ordinary differential equation is $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 0$ is such that y(0)=2 and $y(1) = \frac{-I-3e}{e^3}$. The value of $\frac{dy}{dt}(t = 0)$ is ____________.

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19. Solution of the differential equation $(D^2 + 4)y = cosec\; 2x$ is ___________.

20. At $t = 0$ a current of 2 amperes flows in an RLC circuit with resistance $R = 40\Omega, L = 0.2H$ and $C = 10^{-5}F$. Find the current flowing in the circuit at $t > 0$ if the initial charge on the capacitor is 1 coulomb. Assume $E = E_0\, cos\, \omega t\, , t > 0$.