قائمة الاسئلة

معادلات تفاضلية - كلية الهندسة - قسم الكهرباء والميكانيك - المستوى الثاني - 3 ساعات - درجة هذا الاختبار (60)

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1) The order of the differential equation $\left(\frac{d^2y}{dx^2}\right)^5 - 3\,x\left(\frac{dy}{dx}\right)^4 + 5y = x^2\,\sin(\ln x),$

1) - 10
2) + 2
3) - 4
4) - 5

2) The general solution of the differential equation $(1-x)dy - ydx = 0,$ is .....

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

2) - $y = c - x$

3) - $y = cx$

4) - $y = c(1 = x)$

3) The differential equation of the family of curves $y = a\cos x$ is .....

1) + $y'' + y = 0$

2) - $y'' + y' = 0$

3) - $y'' - y = 0$

4) - $y' + y = 0$

4) The differential equation $(x^2 + x^3 + 2a\,y^2)dx + (y^3 - y + bxy)dy = 0,$ is ....

1) - $b = a$

2) -

$b = 2a$

3) + $b = 4a$

4) - $a = 2b$

5) The solution of the differential equation $(5x + 4y)dx + (4x - 8y^3)dy = 0$ is

1) - $y = \frac{5}{2}x^2 + 4xy - y^4$

2) - $\frac{5}{2}x^2 - y^4 + 4xy = C$

3) - $\frac{5}{2}x^2 + y^4 + 2\,x^2$

4) + None of those

6) The integrating factor of $(2y^2 + 5\,xy^3)dx + (xy + 3x^2y^2)\,dy = 0$ is

1) - $\mu = y^2$

2) - $\mu = x^2$

3) - $\mu = -x^{-2}$

4) + None of those.

7) The first-order linear differential equations can be applied in...

1) - Population growth
2) - Newton's Law of Cooling
3) - Electrical Circuits (RL Circuits)
4) + All of the above

8) A non-separable DE of the form $\frac{dy}{dx} = f(x,y) = -\frac{M(x,y)}{N(x,y)}$, when $f(x,y)$ is homogeneous of the zero degree (in another word $M(x,y)$, $N(x,y)$ are homogeneous of the same degree), by putting $y = ux$ reduces to

1) -

$$\frac{N(1,u)\ du}{N(1,u)+uM(1,u)} = -\frac{dx}{x}$$

2) - $$\frac{du}{f(u)-u} = -\frac{dx}{x}$$

3) - $$\frac{M(1,u)\ du}{M(1,u)+uN(1,u)} = -\frac{dx}{x}.$$

4) + $$\frac{N(1,u)\ du}{M(1,u)+uN(1,u)} = -\frac{dx}{x}$$

9) The general solution of Bernoulli's equation is $x\frac{dy}{dx} + 2y = y^3$ is

1) + $$y^{-2} = \frac{1}{2} + x^4 c$$

2) - $$y^2 = \frac{1}{2} + x^4 c$$

3) - $$y^{-2} = \frac{1}{2} + x^{-4} c$$

4) - None of those

10) Which of the following represents the general solution for the equation $y''' - 5y'' + 8y' - 4 = 0$

1) - $$y = c_1 e^{2x} + (c_2 + x\ c_3)e^x$$

2) + $$y = c_1 e^x + (c_2 + x\ c_3)e^{2x}$$

3) - $$y = c_1 e^{2x} + c_2 e^{-2x} + c_3 e^x$$

4) - None of those

11) The function $y = e^x(c_1 \cos(2x) + c_2 \sin(2x))$ is solution of

1) +

$$y'' - 2y' + 5y = 0$$

2) - $$y'' - 2y' - 5y = 0$$

3) - $$y'' + 2y' + 5y = 0$$

4) - None of those.

12) The characteristic equation of the equation $x^2y'' - 3xy' + 4y = 0$ is

1) - $$r^2 - 3r + 4 = 0$$

2) - $$r^2 + 4r + 4 = 0$$

3) + $$r^2 - 4r + 4 = 0$$

4) - None of those.

13) . The general solution of $(D+2)(D-4)y = e^{2x}$ is

1) - $$y = c_1e^{-2x} + c_2e^{4x} + \frac{1}{8}e^{2x}$$

2) + $$y = c_1e^{-2x} + c_2e^{4x} - \frac{1}{8}e^{2x}$$

3) - $$y = c_1e^{-2x} + c_2e^{-4x} + \frac{1}{24}e^{2x}$$

4) - none of those

14) The solution of the initial value problem

$$y'' + y = 5,\ \ y(0) = 0,\ \ y'(0) = 0 \text{ is}$$

1) - $$y(x) = 5 - \cos x$$

2) - $$y(x) = c_1\cos x + c_2\sin x$$

3) - $y(x) = 1 - \cos x$

4) + $y(x) = 5 - 5\cos x$

15) The complementary function y_c of $x^2y'' + 9xy' + 12y = x^2$ is:

1) - $y_c = c_1e^{-2x} + c_2e^{-6x}$

2) - $y_c = c_1e^{2x} + c_2e^{6x}$

3) + $y_c = c_1x^{-2} + c_2x^{-6}$

4) - $y_c = c_1x^2 + c_2x^6$

16) The particular solution y_p of $x^2y'' + 9xy' + 12y = x^2$ is:

1) + $y_p = \frac{1}{32}x^2$

2) - $y_p = \frac{1}{32}\ln x$

3) - $y_p = -\frac{x^2}{4}\ln x$

4) - $y_p = -\frac{x^2}{2}\ln x$

17) Solve the equation $y'' + 4y = \sin 2x$ is

1) - $y = c_1\cos 2x + c_2\sin 2x + \left(\frac{1}{4}x + \frac{1}{16}\sin 4x\right)\cos 2x + \left(\frac{1}{8}\sin^2 2x\right)\sin 2x$

2) - $y = c_1\cos 2x + c_2\sin 2x + \left(-\frac{1}{4}x + \frac{1}{16}\sin 4x\right)\cos 2x + \left(-\frac{1}{8}\sin^2 2x\right)\sin 2x$

3) + $y = c_1\cos 2x + c_2\sin 2x + \left(-\frac{1}{4}x + \frac{1}{16}\sin 4x\right)\cos 2x + \left(\frac{1}{8}\sin^2 2x\right)\sin 2x$

4) - none of those

18) By variation of parameter method the particular solution of $y'' + 3y' + 2y = e^{e^x}$ is $y_p = c_1y_1 + c_2y_2$ where $c_1(x) = \int \frac{-y_1\ e^x}{w} dx$, and Wronskian $W =$ .....

1) - $W = -e^{2x}$

2) + $W = -e^{3x}$

3) - $W = e^{3x}$

4) - none of those

19) By variation of parameter method the particular solution of $y'' + 3y' + 2y = e^{e^x}$ is $y_p = c_1y_1 + c_2y_2$ where $c_1(x)$, is

1) + $c_1(x) = e^{e^x}$

2) - $c_1(x) = e^x$

3) - $c_1(x) = -e^x\, e^{e^x}$

4) - none of those

20) Which of the following group of functions are linearly independent?

1) - $y_1 = 2x, \quad y_2 = 3x^2 \quad , \; and \quad y_3 = 5x - 8x^3$

2) + $y_1 = 2x, \quad y_2 = 3x^2 \quad , \; and \quad y_3 = 5e^x$

3) - $y_1 = x, \quad y_2 = x^2 \quad , \; and \quad y_3 = x + x^2$

4) - none of those

21) The Laplace transform of $\sqrt{\frac{t^5}{e^{4t}}}$ is:

1) - $\frac{15}{8} \frac{\sqrt{\pi}}{(s+4)^{\frac{7}{2}}}$

2) + $\frac{15}{8} \frac{\sqrt{\pi}}{(s+2)^{\frac{7}{2}}}$

3) - $\frac{15}{8}\frac{\sqrt{\pi}}{s^{\frac{7}{2}}}$

4) - none of those

22) . The function $f(x)=\begin{cases}2t\ , & 0< x<3\\ 5, & 3<x<5\\ e^x\ , & 5<x\end{cases}$ in term of unit step function is

1) + $2t\ -2t\,u(x-3)+5u(x-3)-5\,u(x-5)+e^x u(x-5)$

2) - $2t\,u(x)+2t\,u(x-3)+5\,u(x-3)-e^x\,u(x-5)+e^x u(x-5)$

3) - $2t\,u(x)-2t\,u(x-3)+5u(x-3)+e^x u(x-5)$

4) - none of those

23) The Laplace transform of $f(x)=\begin{cases}2t\ , & 0< x<3\\ 5, & 3<x<5\\ e^x\ , & 5<x\end{cases}$ is

1) - $\frac{2}{s^2}-2\left(\frac{1}{s^2}+\frac{1}{s}\right)e^{-3s}+\frac{5}{s}\,e^{-3s}+\frac{5}{s}\,e^{-5s}+\left(\frac{1}{s-1}\right)\,e^{-5s}$

2) - $\frac{2}{s^2}-2\left(\frac{1}{s^2}\right)e^{-3s}+\frac{5}{s}\,e^{-3s}-\frac{5}{s}\,e^{-5s}+\left(\frac{1}{s-1}\right)\,e^{-5s}$

3) + $\frac{2}{s^2}-2\left(\frac{1}{s^2}+\frac{3}{s}\right)e^{-3s}+\frac{5}{s}\,e^{-3s}-\frac{5}{s}\,e^{-5s}+\left(\frac{1}{s-1}\right)\,e^{5(1-s)}$

4) - none of those

24) $L\{e^{-2t}\sin(5\,t)\}=.\dots\dots\dots$

1) + $\frac{5}{(s+2)^2+25}$

2) - $\frac{s+2}{(s+2)^2+25}$

3) - $\frac{5}{s^2+25}$

4) - none of those

25)

$.L\{4t^2 + \sin 3t + e^{2t}\} = \ldots\ldots\ldots$

A $\frac{8}{s^3} + \frac{s}{s^2+9} + \frac{1}{s-2}$

B $\frac{8}{s^3} + \frac{3}{s^2+9} + \frac{1}{s-2}$

C $\frac{4}{s^3} + \frac{3}{s^2+9} + \frac{1}{s-2}$

D None of these.

1)	-	A
2)	+	B
3)	-	C
4)	-	D

26) If $L^{-1}\{\tan^{-1} s\} = \cdots\ldots\ldots$

A $\frac{1}{t}\cos t$

B $-\frac{1}{t}\sin t$

C $\frac{1}{t}\sin t$

D None of these.

1)	-	A
2)	+	B
3)	-	C
4)	-	D

27) Which statements is False

A $\mathcal{L}\{t^n\} = \frac{n!}{s^{n+1}}$ $n = 0,1,2,\ldots$

B $\Gamma(n+1) = n\,\Gamma(n)$

C $\Gamma(x) = \int_0^\infty e^{-u}\ u^{x+1}\ du$

D $\Gamma(n+1) = n!$ $n = 0,1,2,\ldots$

1)	-	A
2)	-	B
3)	+	C

4) - D

28) The differential equation associated by the solution $y = c_1 + c_2e^{5x} + c_3e^{-7x}$ is

A $y''' + 2y'' + y' = 0$

B $4y''' + 5y'' - 20y' = 0$

C $y''' + 2y'' - 35y' = 0$

D $y''' - 2y'' + 35y' = 0$

1) - A
2) - B
3) + C
4) - D

29) In the differential equation $\cos(x)\frac{dy}{dx} - \sin(x)y = 1$ The integrating factor is:

A $\mu = e^{-\cos(x)}$.

B $\mu = \frac{1}{\cos(x)}$.

C $\mu = e^{\sin(x)}$.

D $\mu = \cos(x)$.

1) - A
2) - B
3) - C
4) + D

30) Let $M\,dx + Ndy = 0$ where $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$. If M and N are homogeneous of same degree, then the integrating factor is

A $\mu = \frac{1}{yM + xN}$

B $\mu = \frac{1}{xM - yN}$

C $\mu = \frac{1}{xM + yN}$

D None of these.

1) - A
2) - B
3) + C
4) - D