5% for each question

1. For $y''+3y'+2y=t$, its general solution is (1) $y=c_1e^{t}+c_2e^{2t}+At$ (2) $y=c_1e^{t}+c_2e^{2t}+At+B$

   (3) $y=c_1e^{-t}+c_2e^{-2t}+At$ (4) $y=c_1e^{-t}+c_2e^{-2t}+At+B$ (5) None

2. For $y''+y'+y=e^{t}$, its general solution is (1) $y=e^{\frac{t}{2}}(c_1\cos\frac{\sqrt{3}t}{2}+c_2\sin\frac{\sqrt{3}t}{2})+Ae^{t}$

   (2) $y=e^{\frac{t}{2}}(c_1\cos\frac{\sqrt{3}t}{2}+c_2\sin\frac{\sqrt{3}t}{2})+Ae^{t}+B$ (3) $y=e^{-\frac{t}{2}}(c_1\cos\frac{\sqrt{3}t}{2}+c_2\sin\frac{\sqrt{3}t}{2})+Ae^{t}$

   (4) $y=e^{-\frac{t}{2}}(c_1\cos\frac{\sqrt{3}t}{2}+c_2\sin\frac{\sqrt{3}t}{2})+Ae^{t}+B$ (5) None

3. For $y''+2y'+y=\sin t$, its general solution is (1) $y=c_1e^{-t}+c_2te^{-t}+A\sin t+B\cos t$

   (2) $y=c_1e^{-t}+c_2e^{-t}\ln t+A\sin t$ (3) $y=c_1e^{-t}+c_2e^{-t}\ln t+A\sin t+B\cos t$

   (4) $y=c_1e^{-t}+A\sin t+B\cos t$ (5) None

4. For $x^2y''+3xy'+y=x$, its general solution is (1) $y=c_1x^{-1}+Ax+B$

   (2) $y=c_1x^{-1}+c_2x^{-1}\ln x+Ax+B$ (3) $y=c_1x^{-1}+c_2x^{-1}\ln x+Ax$ (4) $y=c_1x^{-1}+c_2x^{-1}\ln x+B$

   (5) None

5. For $x^2y''-2xy'+2y=\ln^3 x$, its general solution is (1) $y=c_1x^{-1}+c_2x^{-2}+A\ln^3 x$

   (2) $y=c_1x+c_2x^2+A\ln^3 x$ (3) $y=c_1x+c_2x^2+A\ln^3 x+B\ln^2 x$

   (4) $y=c_1x+c_2x^2+A\ln^3 x+B\ln^2 x+C\ln x$ (5) None

6. Given $F(s)=\int_0^{\infty}f(t)e^{-st}dt$ and $u(t)=\begin{cases}0 & t<0\\ 1 & t\ge 0\end{cases}$, then the Laplace transform of $t^2u(t-1)$ is

   (1) $\frac{2}{s^3}$ (2) $\frac{1}{s^3}$ (3) $\frac{e^{-s}}{s^3}$ (4) $\frac{e^{s}}{s^3}$ (5) none

7. The Laplace transform of $e^{2t}\sin 3t$ is (1) $\frac{3}{s^2+9}$ (2) $\frac{s}{s^2+9}$ (3) $\frac{3}{s^2-4s+9}$ (4) $\frac{3}{s^2-4s+13}$

   (5) $\frac{s-2}{s^2-4s+13}$

8. The Laplace transform of $t^2 f(t)$ is (1) $\frac{d^2F(s)}{ds^2}$ (2) $F(s)e^{2s}$ (3) $s^2F(s)$ (4) $\frac{F(s)}{s^2}$ (5) none

9. For a nonsingular square matrix $A=\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then (1) $A^{-1}=\frac{\begin{bmatrix} a & b \\ c & d \end{bmatrix}}{bc-ad}$ (2) $A^{-1}=\frac{\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}}{ad-bc}$

(3) $A^{-1}=\frac{\begin{bmatrix} d & b \\ c & a \end{bmatrix}}{ad-bc}$ (4) $A^{-1}=\frac{\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}}{bc-ad}$ (5) none

10. Given $A=\begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$, then (1) $A^2=\begin{bmatrix} 4 & 1 & 0 \\ 0 & 4 & 1 \\ 0 & 0 & 4 \end{bmatrix}$ (2) $A^2=\begin{bmatrix} 4 & 4 & 1 \\ 0 & 4 & 4 \\ 0 & 0 & 4 \end{bmatrix}$ (3) $A^3=\begin{bmatrix} 8 & 4 & 1 \\ 0 & 8 & 4 \\ 0 & 0 & 8 \end{bmatrix}$

(4) $A^3=\begin{bmatrix} 8 & 4 & 0 \\ 0 & 8 & 4 \\ 0 & 0 & 8 \end{bmatrix}$ (5) none

11. The eigenvalues of $A=\begin{bmatrix} -1 & 1 \\ 4 & 2 \end{bmatrix}$ are： (1) $\lambda_1=3,\lambda_2=-2$ (2) $\lambda_1=2,\lambda_2=-3$ (3) $\lambda_1=4,\lambda_2=-3$

(4) $\lambda_1=-3,\lambda_2=4$ (5) none

12. The value of $\left(\frac{1-\sqrt{3}i}{2i}\right)^6$ is： (1) 1 (2) -1 (3) 0 (4) 2 (5) None

13. The derivative of $f(z)=2z^3-2iz^2+6-3i$ at $z_0=2i$ is ： (1) 8 (2) -8 (3) 16 (4) -16 (5) None

14. The solution of the partial differential equation $u_x=y^2+\sin y$ with $u(1,y)=y^3$ is：

(1) $u=xy^2+x\sin y+y^3-y^2-\sin y$ (2) $u=xy^2+y\sin x+y^3-y^2-\sin x$

(3) $u=xy^2+x\cos y+y^3-y^2-\cos x$ (4) $u=xy^2+y\cos x+y^3-y^2-\cos y$ (5) None

15. The interval of the function $f(x)=5\sin\frac{2}{3}x$ is ： (1) π (2) 2π (3) 3π (4) 4π (5) None

16. The radius of convergence of the series $\sum_{n=0}^{\infty}\frac{n}{5^n}x^n$ is ：(1) 1 (2) 3 (3) 5 (4) 7 (5) None

17. $\vec{A}=(2\ ,-1\ ,4)$ ， $\vec{B}=(-1\ ,4\ ,3)$ ， $\vec{C}=(3\ ,1\ ,-1)$, which of the following is correct?

(1) $\vec{A}\cdot(\vec{B}\times\vec{C})=-36$ (2) $\vec{A}\cdot(\vec{B}\times\vec{C})=-74$ (3) $\vec{B}\cdot(\vec{A}\times\vec{C})=28$ (4) $\vec{B}\cdot(\vec{A}\times\vec{C})=46$

(5) None

18. $f(x,y,z)=xy+e^{yz}$, $\vec{u}=(\frac{1}{\sqrt{14}},\frac{-2}{\sqrt{14}},\frac{3}{\sqrt{14}})$, which of the following is wrong?

(1) $\nabla f(x,y,z)=(f_x,\ f_y,\ f_z)=(y,\ x+z\,e^{yz},\ y\,e^{yz})$ (2) $\nabla f(1,0,1)=(0,2,0)$

(3) $D_u f(x,y,z)=\frac{1}{\sqrt{14}}y-\frac{2}{\sqrt{14}}(x+ze^{yz})+\frac{3}{\sqrt{14}}ye^{yz}$ (4) $D_u f(1,1,0)=\frac{2}{\sqrt{14}}$ (5) None

19. $\vec{A}=(xz\ \ ,yx\ \ ,zy)$, which one of the following is correct?

(1) $div\,\vec{A}=z+x+y$ (2) $div\,\vec{A}=xz+yx+zy$

(3) $curl\,\vec{A}=(x,y,z)$ (4) $curl\,\vec{A}=(yz,xz,xy)$ (5) None

20. About even function and odd function, which one of the following is correct?

(1) $f(x)=x^2$ is odd function (2) $f(x)=x^5$ is even function

(3) $f(x)=x\sin x$ is odd function (4) $f(x)=e^{x^2}$ is odd function (5) None