SUBJECT NAME : Engineering Mathematics - II

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Name of the Student: Branch:

Unit – I (Ordinary Differential Equation)

• Type – I to VI

1. Solve the equation $(D^2+4)y = x^2\cos 2x$. (M/J 2009),(N/D 2011)

2. Solve the equation $(D^2-3D+2)y = 2\cos(2x+3)+2e^x$. (N/D 2009)

3. Solve $(D^2+16)y = \cos^3 x$. (N/D 2010)

4. Solve : $(D^2+3D+2)y = \sin x + x^2$. (M/J 2011)

5. Solve the equation $(D^2+5D+4)y = e^{-x}\sin 2x$. (A/M 2011),(ND 2012)

6. Solve the equation $(D^2+4D+3)y = e^{-x}\sin x$. (M/J 2010)

7. Solve: $(D^2-4D+3)y = e^x\cos 2x$. (M/J 2012)

8. Solve $(D^2+4D+3)y = 6e^{-2x}\sin x\sin 2x$. (N/D 2011)

• Method of Variation of Parameters

1. Solve $(D^2+a^2)y = \tan ax$ by the method of variation of parameters. (M/J 2009)

2. Solve, $\frac{d^2y}{dx^2}+a^2y = \tan ax$ by method of variation of parameters. (M/J 2011)

3. Apply method of variation of parameters to solve $(D^2+4)y = \cot 2x$.

(N/D 2009),(N/D 2011)

4. Solve $(D^2+a^2)y = \sec ax$ using the method of variation of parameters.(M/J 2012)

5. Solve $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$ by the method of variation of parameters.

(A/M 2011),(ND 2012)

6. Solve $(D^2+1)y = x\sin x$ by the method of variation of parameters. (M/J 2010)

7. Using variation of parameters, solve $(2D^2 - D - 3)y = 25e^{-x}$. (N/D 2011)

8. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = \frac{e^{-x}}{x^2}$ by the method of variation of parameters. (M/J 2013)

- **Cauchy and Legendre Equations**

1. Solve the equation $(x^2D^2 + 3xD + 5)y = x\cos(\log x)$. (M/J 2009)

2. Solve $(x^2D^2 - 3xD + 4)y = x^2\cos(\log x)$. (N/D 2010)

3. Solve $(x^2D^2 - xD + 4)y = x^2\sin(\log x)$. (M/J 2012),(N/D 2009)

4. Solve $(x^2D^2 - 2xD - 4)y = x^2 + 2\log x$. (M/J 2010)

5. Solve the equation $\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} = \frac{12\log x}{x^2}$. (N/D 2012)

6. Solve $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = x^2\ln x$. (N/D 2011)

7. Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = x^2 + \frac{1}{x^2}$. (M/J 2013)

8. Solve $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$. (A/M 2011)

9. Solve: $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 4\cos[\log(1+x)]$. (N/D 2011)

10. Solve $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$. (M/J 2013)

- **Simultaneous Differential Equations**

1. Solve $\frac{dx}{dt} + y = \sin t$, $\frac{dy}{dt} + x = \cos t$ given $x = 2$ and $y = 0$ at $t = 0$. (M/J 2009)
2. Solve $\frac{dx}{dt} + 2y = \sin 2t$, $\frac{dy}{dt} - 2x = \cos 2t$. (M/J 2012),(N/D 2009)
3. Solve $\frac{dx}{dt} + 2y = -\sin t$, $\frac{dy}{dt} - 2x = \cos t$ given $x = 1$, $y = 0$ at $t = 0$. (N/D 2010)
4. Solve $\frac{dx}{dt} - y = t$ and $\frac{dy}{dt} + x = t^2$. (A/M 2011)
5. Solve $\frac{dx}{dt} - y = t$ and $\frac{dy}{dt} + x = t^2$ given $x(0) = y(0) = 2$. (N/D 2011)
6. Solve $\frac{dx}{dt} + y = e^t$, $x - \frac{dy}{dt} = t$. (N/D 2012)
7. Solve $\frac{dx}{dt} + 2x + 3y = 2e^{2t}$, $\frac{dy}{dt} + 3x + 2y = 0$. (M/J 2010)
8. Solve $\frac{dx}{dt} + 5x - 2y = t$, $\frac{dy}{dt} + 2x + y = 0$. (M/J 2013)
9. Solve $\frac{dx}{dt} + 2x - 3y = t$ and $\frac{dy}{dt} - 3x + 2y = e^{2t}$. (N/D 2011)
10. Solve for x from the equations $D^2x + y = 3e^{2t}$, $Dx - Dy = 3e^{2t}$. (M/J 2011)

Unit – II (Vector Calculus)

- **Simple problems on vector calculus**

1. Find the directional derivative of $\phi = 2xy + z^2$ at the point $(1, -1, 3)$ in the direction of $i + 2j + 2k$. (M/J 2009)

2. Prove that $F = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$ is irrotational vector and find the scalar potential such that $F = \nabla\varphi$. (M/J 2010)

3. Show that $F = (y^2 + 2xz^2)i + (2xy - z)j + (2x^2z - y + 2z)k$ is irrotational and hence find its scalar potential. (M/J 2012)

4. Show that $F = (2xy - z^2)i + (x^2 + 2yz)j + (y^2 - 2zx)k$ is irrotational and find its scalar potential. (N/D 2012)

5. Find the angle between the normals to the surface $xy^3z^2 = 4$ at the points $(-1, -1, 2)$ and $(4, 1, -1)$. (M/J 2009)

6. Find the angle between the normals to the surface $xy = z^2$ at the points $(1, 4, 2)$ and $(-3, -3, 3)$. (A/M 2011)

7. Find the work done in moving a particle in the force field given by $F = 3x^2 i + (2xz - y)j + zk$ along the straight line from $(0, 0, 0)$ to $(2, 1, 3)$.
(M/J 2012)

8. If r is the position vector of the point (x, y, z), Prove that $\nabla^2 r^n = n(n+1)r^{n-2}$.
(N/D 2010)

9. Determine $f(r)$, where $r = xi + yj + zk$, if $f(r)r$ is solenoidal and irrotational.
(N/D 2011)

10. If F is a vector point function, prove that $\text{curl curl} F = \nabla(\nabla \cdot F) - \nabla^2 F$.
(N/D 2011)(AUT)

11. Prove that $\text{curl}(u \times v) = (v \cdot \nabla)u - (u \cdot \nabla)v + u\,\text{div}\,v - v\,\text{div}\,u$. (N/D 2009)

12. Evaluate $\int_C (x^2 + xy)\,dx + (x^2 + y^2)\,dy$ where C is the square bounded by the lines $x = 0, x = 1, y = 0$ and $y = 1$. (N/D 2009),(N/D 2011)

13. Evaluate $\iint_S F \cdot n\, ds$ where $F = 2xyi + yz^2 j + xzk$ and S is the surface of the parallelepiped bounded by $x = 0, y = 0, z = 0, x = 2, y = 1$ and $z = 3$. (M/J 2011)

• Green's Theorem

1. Verify Green's theorem in a plane for $\int_C \left[(3x^2 - 8y^2)\, dx + (4y - 6xy)\, dy \right]$, Where C is the boundary of the region defined by the lines $x = 0, y = 0$ and $x + y = 1$.

(N/D 2010) ,(A/M 2011),(M/J 2011), (M/J 2012)

2. Verify Green's theorem for $\int_C (3x^2 - 8y^2)\, dx + (4y - 6xy)\, dy$ where C is the boundary of the region defined by $x = y^2, y = x^2$. (M/J 2010)

3. Verify Green's theorem for $V = (x^2 + y^2)i - 2xyj$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$ and $y = b$. (N/D 2012)

• Stoke's Theorem

1. Verify Stoke's theorem for $F = xyi - 2yzj - zxk$ where S is the open surface of the rectangular parallelepiped formed by the planes $x = 0, x = 1, y = 0, y = 2$ and $z = 3$ above the XY plane. (M/J 2009)

2. Verify Stoke's thorem for the vector $F = (y - z)i + yzj - xzk$, where S is the surface bounded by the planes $x = 0, y = 0, z = 0, x = 1, y = 1, z = 1$ and C is the square boundary on the xoy -plane. (N/D 2011)

3. Verify Stoke's theorem when $F = (2xy - x^2)i - (x^2 - y^2)j$ and C is the boundary of the region enclosed by the parabolas $y^2 = x$ and $x^2 = y$. (N/D 2009)

4. Verify Stoke's theorem for the vector field $F = (2x - y)i - yz^2 j - y^2 zk$ over the upper half surface $x^2 + y^2 + z^2 = 1$, bounded by its projection on the xy -plane. (M/J 2013)

5. Evaluate $\int_C (\sin z\,dx - \cos x\,dy + \sin y\,dz)$ by using Stoke's theorem, where C is the boundary of the rectangle defined by $0 \le x \le \pi$, $0 \le y \le 1$, $z = 3$. (N/D 2009)

6. Using Stokes theorem, evaluate $\int_C F \cdot dr$, where $F = y^2 i + x^2 j - (x + z)k$ and 'C' is the boundary of the triangle with vertices at $(0, 0, 0)$, $(1, 0, 0)$, $(1,1, 0)$.(M/J 2012)

7. Using Stoke's theorem prove that $\operatorname{curl}\operatorname{grad}\phi = 0$. (M/J 2011)

- **Gauss Divergence Theorem**

1. Verify Gauss divergence theorem for $F = x^2 i + y^2 j + z^2 k$ where S is the surface of the cuboid formed by the planes $x = 0, x = a, y = 0, y = b, z = 0$ and $z = c$.(M/J 2009)

2. Verify Gauss Divergence theorem for $F = 4xzi - y^2 j + yzk$ over the cube bounded by $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. (N/D 2010),(A/M 2011),(N/D 2012)

3. Verify Gauss – divergence theorem for the vector function $f = (x^3 - yz) i - 2x^2 yj + 2k$ over the cube bounded by $x = 0, y = 0, z = 0$ and $x = a, y = a, z = a$. (M/J 2010),(N/D 2011)

4. Verify divergence theorem for $F = x^2 i + zj + yzk$ over the cube formed by the planes $x = \pm 1, y = \pm 1, z = \pm 1$. (M/J 2013)

5. Verify Gauss's theorem for $F = (x^2 - yz) i + (y^2 - zx) j + (z^2 - xy) k$ over the rectangular parallelepiped formed by $0 \le x \le 1, 0 \le y \le 1$ and $0 \le z \le 1$.

(N/D 2011)(AUT)

Unit – III (Analytic Function)

- **Harmonic Function & Analytic Function**

1. Verify that the families of curves $u = c_1$ and $v = c_2$ cut orthogonally, when $u + iv = z^3$.

(N/D 2009)

2. Prove that $u = e^{-x}\cos y$ and $v = e^{-x}\sin y$ satisfy Laplace equations, but that $u + iv$ is not an analytic function of z. (M/J 2011)

3. When the function $f(z) = u + iv$ is analytic, prove that the curves $u = \text{constant}$ and $v = \text{constant}$ are orthogonal. (N/D 2009)

4. Show that the families of curves $r^n = a \sec n\theta$ and $r^n = b \operatorname{cosec} n\theta$ cut orthogonally. (M/J 2011)

5. Show that $u = \frac{1}{2}\log(x^2 + y^2)$ is harmonic. Determine its analytic function. Find also its conjugate. (A/M 2011)

6. Prove that $u = x^2 - y^2$ and $v = \frac{-y}{x^2 + y^2}$ are harmonic but $u + iv$ is not regular. (N/D 2010)

7. Prove that every analytic function $w = u + iv$ can be expressed as a function z alone, not as a function of $\bar{z}$.(M/J 2010),(M/J 2012)

8. Find the analytic function $f(z) = P + iQ$, if $P - Q = \frac{\sin 2x}{\cosh 2y - \cos 2x}$.(M/J 2009)

9. Determine the analytic function whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. (N/D 2012)

10. If $w = f(z)$ is analytic, prove that $\frac{dw}{dz} = \frac{\partial w}{\partial x} = -i\frac{\partial w}{\partial y}$ (A/M 2011)

11. Find the analytic function $u + iv$, if $u = (x - y)(x^2 + 4xy + y^2)$. Also find the conjugate harmonic function v . (N/D 2009)

12. Find the analytic function $w = u + iv$ when $v = e^{-2y}(y \cos 2x + x \sin 2x)$ and find u . (N/D 2011)

13. Prove that $u = e^x(x \cos y - y \sin y)$ is harmonic (satisfies Laplace's equation) and hence find the analytic function $f(z) = u + iv$. (N/D 2010),(M/J 2013)

14. If $f(z)$ is a analytic function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. (M/J 2009), (A/M 2011),(M/J 2013)

15. If $f(z)$ is an analytic function of z , prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\log|f(z)| = 0$. (M/J 2012)

16. If $f(z)$ is analytic function of z in any domain, prove that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^p = p^2|f(z)|^{p-2}|f'(z)|^2.$$

(N/D 2011)(AUT)

• Conformal Mapping

1. Find the image of the half plane $x > c$, when $c > 0$ under the transformation $w = \frac{1}{z}$. Show the regions graphically. (M/J 2009),(N/D 2012)

2. Find the image of the circle $z - 1 = 1$ under the mapping $w = \frac{1}{z}$. (N/D 2009)

3. Find the image of the circle $z - 2i = 2$ under the transformation $w = \frac{1}{z}$. (M/J 2013)

4. Find the image of the hyperbola $x^2 - y^2 = 1$ under the transformation $w = \frac{1}{z}$.
(M/J 2010),(M/J 2012),(N/D 2012)

5. Find the image of $z = 2$ under the mapping (1) $w = z + 3 + 2i$ (2) $w = 3z$.
(A/M 2011)

6. Prove that the transformation $w = \frac{z}{1 - z}$ maps the upper half of z - plane on to the upper half of w - plane. What is the image of $z = 1$ under this transformation?
(M/J 2010),(N/D 2012)

7. Prove that the transformation $w = \frac{1}{z}$ maps the family of circles and straight lines into the family of circles or straight lines. (N/D 2011)

8. Show that the transformation $w = \frac{1}{z}$ transforms, in general, circles and straight lines into circles and straight lines that are transformed into straight lines and circles respectively.(N/D 2011)(AUT)

• Bilinear Transformation

1. Find the bilinear transformation which maps the points $z = 0, -i, -1$ into w – plane $w = i, 1, 0$ respectively. (M/J 2009)

2. Find the bilinear transformation which maps the points $z = 0, 1, \infty$ into $w = i, 1, -i$ respectively. (M/J 2010),(M/J 2012),(M/J 2013)

3. Find the bilinear transformation that maps the points $z = \infty , i , 0$ onto $w = 0, i , \infty$ respectively.(N/D 2012)

4. Find the bilinear transformation which maps the points $z = 1, i , -1$ into the points $w = i , 0, - i$. Hence find the image of $z < 1$. (M/J 2011)

5. Find the bilinear transformation that transforms $1, i$ and -1 of the z – plane onto $0, 1$ and ∞ of the w – plane. Also show that the transformation maps interior of the unit circle of the z – plane on to upper half of the w – plane.(N/D 2010)

6. Find the Bilinear transformation that maps the points $1 + i , - i , 2 - i$ of the z - plane into the points $0,1, i$ of the w - plane. (N/D 2011)

Unit – IV (Complex Integration)

- **C.I.F and C.R.T**

1. Evaluate $\int_c \frac{z\,dz}{(z-1)(z-2)^2}$ where c is the circle $z - 2 = \frac{1}{2}$ using Cauchy's integral formula. (M/J 2009),(N/D 2009),(M/J 2012)

2. Evaluate $\int_C \frac{(z+1)}{\left(z^2 + 2z + 4\right)^2} dz$ where C is $z + 1 + i = 2$ using Cauchy's integral formula.

   (A/M 2011)

3. Evaluate $\int_c \frac{z+4}{z^2 + 2z + 5} dz$, where C is the circle $z + 1 + i = 2$, using Cauchy's integral formula. (N/D 2010),(N/D 2011),(N/D 2012)

4. Using Cauchy's integral formula evaluate $\int_c \frac{z}{z^2 + 1} dz$, where C is the circle $z + i = 1$.

   (M/J 2011)

5. Using Cauchy's integral formula, evaluate $\int_C \frac{4 - 3z}{z(z-1)(z-2)} dz$, Where ' C ' is the circle $z = \frac{3}{2}$. (M/J 2010)

6. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, where C is $z = 3$. (N/D 2011),(M/J 2013)

7. Evaluate $\int_C \frac{z-1}{(z+1)^2(z-2)}\,dz$, where C is the circle $|z-i|=2$ using Cauchy's residue theorem.

• Contour Integral of Types – I ,II &III

1. Evaluate $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$ using contour integration.

(N/D 2009), (M/J 2010), (N/D 2009) ,(A/M 2011)

2. Evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$ $(a>b>0)$, using contour integration. (N/D 2011)

3. Evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta}\,d\theta$ using contour integration. (M/J 2013)

4. Evaluate $\int_0^{2\pi} \frac{\sin^2\theta}{a+b\cos\theta}\,d\theta$, $a>b>0$. (N/D 2012)

5. Evaluate $\int_0^{2\pi} \frac{d\theta}{1-2x\sin\theta+x^2}$, $(0<x<1)$. (M/J 2009)

6. Evaluate, by contour integration, $\int_0^{2\pi} \frac{d\theta}{1-2a\sin\theta+a^2}$,$0<a<1$. (M/J 2011)

7. Evaluate $\int_{-\infty}^{\infty} \frac{x^2-x+2}{x^4+10x^2+9}\,dx$ using contour integration. (M/J 2010),(A/M 2011)

8. Evaluate $\int_{-\infty}^{\infty} \frac{x^2\,dx}{(x^2+a^2)(x^2+b^2)}$, $a>b>0$. (M/J 2009),(M/J 2013)

9. Evaluate $\int_{-\infty}^{\infty} \frac{dx}{(x^2+1)(x^2+4)}$ using contour integration. (N/D 2010)

10. Evaluate using contour integration $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)^2}\,dx$. (N/D 2011)

11. Evaluate $\int_0^\infty \frac{dx}{\left(x^2+a^2\right)^3}$, $a>0$ using contour integration. (N/D 2009)

12. Evaluate $\int_0^\infty \frac{\cos mx}{x^2+a^2}\,dx$, using contour integration. (M/J 2012)

13. Evaluate $\int_{-\infty}^{\infty} \frac{\cos x\,dx}{\left(x^2+a^2\right)\left(x^2+b^2\right)}$, $a > b > 0$. (N/D 2011)

- **Taylor's and Laurent's Series**

1. Expand $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ as a Laurent's series in the region $2 < z < 3$.
   (A/M 2011),(M/J 2011),(N/D 2011)

2. Find the Laurent's series of $f(z) = \frac{z^2-1}{z^2+5z+6}$ valid in $2 < z < 3$. (M/J 2009)

3. Expand the function $f(z) = \frac{z^2-1}{z^2+5z+6}$ in Laurent's series for $z > 3$. (M/J 2013)

4. Evaluate $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for the regions $z > 3$ and $1 < z < 3$. (N/D 2009),(M/J 2012)

5. Find the Laurants's series expansion of $f(z) = \frac{1}{z(1-z)}$ valid in the regions $z+1 < 1$, $1 < z+1 < 2$ and $z+1 > 2$. (N/D 2011)

6. Find the Laurent's series of $f(z) = \frac{7z-2}{z(z+1)(z+2)}$ in $1 < z+1 < 3$. (M/J 2010)

7. Find the residues of $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ at its isolated singularities using Laurent's series expansions. Also state the valid region. (N/D 2010),(N/D 2012)

Unit – V (Laplace Transform)

• Laplace Transform of Periodic Function

1. Find the Laplace transform of $f(t) = \begin{cases} t, & \text{for } 0 < t < a \\ 2a - t, & \text{for } a < t < 2a \end{cases}$, $f(t + 2a) = f(t)$.
(M/J 2009),(N/D 2009),(A/M 2011)

2. Find the Laplace transform of the following triangular wave function given by
$f(t) = \begin{cases} t, & 0 \le t \le \pi \\ 2\pi - t, & \pi \le t \le 2\pi \end{cases}$ and $f(t + 2\pi) = f(t)$.
(M/J 2010),(M/J 2012)

3. Find the Laplace transform of $f(t) = \begin{cases} t, & 0 < t < 1 \\ 0, & 1 < t < 2 \end{cases}$ and $f(t + 2) = f(t)$ for $t > 0$.
(N/D 2011)(AUT)

4. Find the Laplace transform of square wave function defined by
$f(t) = \begin{cases} 1, & \text{in } 0 < t < a \\ -1, & \text{in } a < t < 2a \end{cases}$ with period $2a$.
(N/D 2009)

5. Find the Laplace transform of square wave function (or Meoander function) of period a as $f(t) = \begin{cases} 1, & \text{in } 0 < t < \frac{a}{2} \\ -1, & \text{in } \frac{a}{2} < t < a \end{cases}$.
(M/J 2013)

6. Find the Laplace transform of
$f(t) = \in, \quad 0 \le t \le a$
$\quad = -\in, \quad a \le t \le 2a$
and $f(t + 2a) = f(t)$ for all t.
(N/D 2010)

7. Find the Laplace transform of a square wave function given by
$f(t) = \begin{cases} E & \text{for } 0 \le t \le \frac{a}{2} \\ -E & \text{for } \frac{a}{2} \le t \le a \end{cases}$, and $f(t + a) = f(t)$.
(N/D 2011)

8. Find the Laplace transform of the Half wave rectifier $f(t) = \begin{cases} \sin \omega t, & 0 < t < \pi/\omega \\ 0, & \pi/\omega < t < 2\pi/\omega \end{cases}$ and $f(t + 2\pi/\omega) = f(t)$ for all t. (N/D 2012)

• Initial and Final Value Theorem& Other Simple Problems

1. Find the Laplace transform of $te^{-2t}\cos 3t$. (M/J 2009)

2. Find $L\left[t^2 e^{-3t}\sin 2t\right]$. (M/J 2013)

3. Verify initial and final value theorems for $f(t) = 1 + e^{-t}(\sin t + \cos t)$.

(M/J 2010),(N/D 2010),(M/J 2012)

4. Find $L\left[\frac{\cos at - \cos bt}{t}\right]$. (A/M 2011),(N/D 2012)

5. Find the Laplace transform of $\frac{e^{at} - e^{-bt}}{t}$. (M/J 2012)

6. Find the Laplace transform of $e^{-4t}\int_0^t t \sin 3t \, dt$. (M/J 2009)

7. Evaluate $\int_0^\infty te^{-2t}\cos t \, dt$ using Laplace transforms. (N/D 2011),(M/J 2012)

8. Find the inverse Laplace transform of $\frac{1}{(s+1)(s^2+4)}$. (M/J 2009)

9. Find $L^{-1}\left\{\ln\left(\frac{s^2+a^2}{s(s+b)^2}\right)\right\}$. (N/D 2011)(AUT)

• Laplace Transform Using Convolution Theorem

1. Using Convolution theorem $L^{-1}\left\{\frac{1}{(s+a)(s+b)}\right\}$. (A/M 2011)

2. Apply convolution theorem to evaluate $L^{-1}\left[\frac{s^2}{(s^2+a^2)^2}\right]$. (M/J 2010),(M/J 2012)

3. Find $L^{-1}\left[\frac{s^2}{(s^2+4)^2}\right]$ using convolution theorem. (N/D 2012)

4. Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ using convolution theorem. (N/D 2010),(M/J 2011)

5. Using convolution theorem find the inverse Laplace transform of $\frac{1}{(s^2+1)(s+1)}$. (N/D 2009),(N/D 2011)(AUT)

6. Find $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$ using convolution theorem. (N/D 2011)

7. Using convolution theorem find the inverse Laplace transform of $\frac{4}{(s^2+2s+5)^2}$. (M/J 2013)

• Solving Differential Equation By Laplace Transform

1. Solve $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 2$, given $x = 0$ and $\frac{dx}{dt} = 5$ for $t = 0$ using Laplace transform method. (A/M 2011),(N/D 2012)

2. Solve the equation $y'' + 9y = \cos 2t$, $y(0) = 1$ and $y\left(\frac{\pi}{2}\right) = -1$ using Laplace transform. (M/J 2009)

3. Solve the differential equation $\frac{d^2y}{dt^2} + y = \sin 2t$; $y(0) = 0$, $y'(0) = 0$ by using Laplace transform method. (N/D 2009)

4. Using Laplace transform solve the differential equation $y'' - 3y' - 4y = 2e^{-t}$ with $y(0) = 1 = y'(0)$. (M/J 2010),(N/D 2010)

5. Solve the differential equation $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = e^{-t}$ with $y(0) = 1$ and $y'(0) = 0$, using Laplace transform. (M/J 2012)

6. Solve $y'' - 3y' + 2y = 4e^{2t}$, $y(0) = -3$, $y'(0) = 5$, using Laplace transform.

(N/D 2011)(AUT)

7. Solve $y'' + 5y' + 6y = 2$, $y(0) = 0$, $y'(0) = 0$, using Laplace transform. (M/J 2013)

8. Solve, by Laplace transform method, the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 5y = e^{-t}\sin t$, $y(0) = 0$, $y'(0) = 1$. (M/J 2011)

9. Solve $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = \sin t$, if $\frac{dy}{dt} = 0$ and $y = 2$ when $t = 0$ using Laplace transforms. (N/D 2011)

----All the Best----