Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441 108
NAAC Accredited with A+ Grade
Approved by AICTE, New Delhi, Govt. of Maharashtra & Affiliated to RTM Nagpur University, Nagpur

Applied Mathematics-III

MCQ common to Mechanical/Electrical/Electronics/ Electronics and Communication Engineering

Unit I
Laplace Transform

Q 1) The value of $L\{\sin 3t\}$ at $s = 0$ is

a)$9/15$ b) $1/3$ c)$\frac{1}{9}$ d) 0

Ans: b

Q 2) The value of $L\{\text{Sinh } 2t\}$ at $s = 0$ is

a)9 b) $-1/2$ c)$\frac{s^2}{s^2-4}$ d) 0

Ans: b

Q 3) Choose a correct option to find $L\{t\, f(t)\}$ if $L\{f(t)\} = \bar{f}(s)$

a)$\bar{f}(s-a)$ b) $\int_s^\infty \bar{f}(s)\, ds$ c) $-\frac{d}{ds}\bar{f}(s)$ d) $\frac{\bar{f}(s)}{s}$

Ans: c

Q 4) Choose a correct option to find $L\{t^2 f(t)\}$ if $L\{f(t)\} = \bar{f}(s)$

a)$\bar{f}(s-a)$ b) $\int_s^\infty \bar{f}(s)\, ds$ c) $\frac{d^2}{ds^2}\bar{f}(s)$ d) $-\frac{d}{ds}\bar{f}(s)$

Ans: c

Q 5) What is the value of $L\{3t^3\}$ at $s = 2$

a) $2/9$ b) $3!/16$ c)$9/8$ d) 1/16

Ans: c

Q.6) What is the value of $L\{2t^2 + 1\}$ at $s = 2$

a) $2/9$ b) $3!/16$ c)1 d) 1/16

Ans: c

Q.7) What is the value of $L\{e^{2t}\cos 2t\}$

a) $\frac{s-2}{s^2-4s+8}$ b) $\frac{s}{s^2+4}$ c) $\frac{s+2}{s^2+4s+8}$ d) $\frac{s}{s^2-4}$

Ans: a

Q.8) What is the value of $L\{e^{-2t}\cos 3t\}$

a) $\frac{s+2}{s^2+4s+13}$ b) $\frac{s}{s+9}$ c) $\frac{s-2}{s^2-s+8}$ d) $\frac{s}{s^2-4}$

Ans: a

Q.9) If $\delta_n = \begin{cases} 1, & \text{for } t = 0 \\ 0, & \text{for } t \neq 0 \end{cases}$ then $L\{\delta_n\} =$

a) $\frac{1}{s}$ b) $\frac{1}{s^2}$ c) $\frac{1}{s^3}$ d) 1

Ans: d

Q.10) what is the value of $L^{-1}\left\{\frac{s-1}{s^2-2s+5}\right\}$

a) $e^t \sin 2t$ b) $e^{2t}\sin 2t$ c) $e^{2t}\cos 2t$ d) $e^t \cos 2t$

Ans: d

Q.11) what is the value of $L^{-1}\left\{\frac{s+1}{s^2+2s+10}\right\}$

a) $e^{-t}\sin 3t$ b) $e^{2t}\sin 2t$ c) $e^{2t}\cos 2t$ d) $e^{-t}\cos 3t$

Ans: d

Q 12) What is the value of $L^{-1}\left\{\frac{s}{s^2+5}\right\}$

a) $\sin\sqrt{2}\,t$ b) $e^{-t}\sin\sqrt{2}\,t$ c) $\cos\sqrt{5}\,t$ d) $e^t\cos\sqrt{5}\,t$

Ans: c

Q 13) What is the value of $L^{-1}\left\{\frac{s}{s^2-5}\right\}$

a) $\cos \sqrt{5}\,t$ b) $e^{-t}\sin t$ c) $\cosh \sqrt{5}\,t$ d) $e^t\cos 5t$

Ans: c

Q 14) What is the value of $L^{-1}\left\{\frac{2}{s^2+9}\right\}$

a) $\frac{1}{2}\sin 3t$ b) $\frac{1}{2}\cos 3t$ c) $\frac{2}{3}\sin 3t$ d) $\frac{2}{3}\cos 3t$

Ans: c

Q.16) What is the value of $L^{-1}\left\{\frac{2}{s^2-16}\right\}$

a) $\frac{1}{2}\sin 3t$ b) $\frac{1}{2}\cos 3t$ c) $\frac{1}{2}\sin 4t$ d) $\frac{2}{3}\cos 3t$

Ans: c

Q.17) What is the value of $L^{-1}\left\{\frac{1}{s^2-2s}\right\}$

a) $\frac{e^{2t}+1}{2}$ b) $\frac{1}{2}\cos 2t$ c) $\frac{1}{2}\sin 2t$ d) $\frac{e^{2t}-1}{2}$

Ans: d

Q.18) What is the value of $L^{-1}\left\{\frac{1}{s^2-3s}\right\}$

a) $\frac{e^{2t}+1}{2}$ b) $\frac{1}{2}\cos 2t$ c) $\frac{1}{2}\sin 2t$ d) $\frac{e^{-3t}-1}{3}$

Ans: d

Q.19) what is the value of $L^{-1}\left\{\frac{1}{s(s+1)}\right\}$

a) $\sin t$ b) $1-e^{-t}$ c) e^{2t} d) t

Ans: b

Q.20) what is the value of $L^{-1}\left\{\frac{1}{s+1}\right\}$

a) $\sin t$ b) e^{-t} c) e^{2t} d) t

Ans: b

Q.21) The value of $L\{5t^4\}$ at $s=2$ is

a) 15/2 b) 4!/15 c) 3/4 d) 15/4

Ans d

Q 22) Laplace transform of 1 is

a) 1/s b) s/2 c) s d) 2/s

Ans a

Q 23 Find the laplace transform of et Sin(at).

a) $\frac{a}{a^2+(s+1)^2}$ b) $\frac{s+1}{a^2+(s+1)^2}$ c) $\frac{a}{a^2+(s-1)^2}$ d) $\frac{s-1}{a^2+(s+1)^2}$

Ans c

Q 24 Laplace transform of $\frac{\sin t}{t}$ is

a) $\sin^{-1} s$ b) $\cos^{-1} s$ c) $\tan^{-1} s$ d) $\cot^{-1} s$

Ans d

Q 25 The value of $L\left\{\int_0^t \sin t\, dt\right\}$ is

a) $\frac{1}{s^2+1}$ b) $\frac{s}{s^2+1}$ c) $\frac{1}{s(s^2+1)}$ d) $\frac{1}{s^2(s^2+1)}$

Ans c

Unit-II

Fourier Series & Fourier Transform

1) A function $f(x)$ is said to be even if $f(-x) =?$

a) $-f(x)$ b) $f(-x)$ c) $\frac{1}{f(x)}$ d) $f(x)$

Ans d)

2) A function $x\ sinx$ is ..... function

a) odd b) even c) neither even nor odd d) none of these

Ans

3) What is the value of a_0 for the function $f(x) = sinx, 0 < x < \pi.$

a) $a_0 = \frac{2}{\pi}$ b) $a_0 = \frac{4}{\pi}$ c) $a_0 = 2\pi$ d) $a_0 = 0$

Ans b)

4) A function $x^2, cosx, sin^2 x$ are .....function.

a) odd b) even c) neither even nor odd d) none of these

Ans b)

5) What is the value of a_0 for the function $f(x) = \frac{1}{4}(\pi - x)^2, 0 < x < 2\pi.$

a) $a_0 = \frac{\pi^3}{6}$ b) $a_0 = \frac{\pi}{12}$ c) $a_0 = \frac{\pi}{160}$ d) $a_0 = \frac{\pi^2}{6}$

Ans b)

6) The given function $f(x) = e^{-x}$ in the interval $-2\pi < x < 2\pi$ is

a) odd b) even c) neither even nor odd d) cant determined

Ans c)

7) If $f(x)=\begin{cases}1+x, & -1<x<0\\ 1-x, & 0<x<1\end{cases}$ then the Fourier coefficient b_n is

a) 1 b) 0 c) -1 d) none of these

Ans b)

8) If $f(x)=\begin{cases}\pi+x, & -\pi<x\leq 0\\ \pi-x, & 0\leq x<\pi\end{cases}$ then the Fourier coefficient b_n is

a) π b) $-\pi$ c) 0 d) None of these

Ans c)

9) At the point of discontinuity the Dirichlet's condition is

a) $f(x)=\frac{f(x^+)+f(x^-)}{2}$ b) $f(x)=\frac{f(x^+)-f(x^-)}{2}$

c) $f(x)=f(x^+)+f(x^-)$ d) $f(x)=f(x^+)-f(x^-)$

Ans a)

10) If $f(x)=\begin{cases}-x^2, & -\pi<x<0\\ x^2, & 0<x<\pi\end{cases}$ then the value of Fourier coefficients is

a) $a_n=0$ b) $b_n=0$ c) $a_0=0, a_n=0$ d) $a_0=0$

Ans c)

11) Fourier sine Transform of f(x) is given by

a) $F_c[f(x)]=\sqrt{\frac{\pi}{2}}\int_0^\infty f(x)\sin(sx)\,dx$

b) $F_s[f(x)]=\sqrt{\frac{2}{\pi}}\int_{-\infty}^\infty f(sx)\sin(sx)\,dx$

c) $F_c[f(x)]=\sqrt{\frac{2}{\pi}}\int_0^\infty f(x)\sin(x)\,dx$

d) $F_s[f(x)]=\sqrt{\frac{2}{\pi}}\int_0^\infty f(x)\sin(sx)\,dx$

Ans d)

12) Fourier Cosine Transform of f(x) is given by

a) $F_c[f(x)]=\sqrt{\frac{\pi}{2}}\int_0^\infty f(sx)\cos(sx)\,dx$

b) $F_c[f(x)]=\sqrt{\frac{2}{\pi}}\int_0^\infty f(x)\cos(x)\,dx$

c) $F_c[f(x)]=\sqrt{\frac{2}{\pi}}\int_0^\infty f(x)\cos(sx)\,dx$

d) $F_c[f(x)]=\sqrt{\frac{2}{\pi}}\int_{-\infty}^\infty f(x)\cos(sx)\,dx$

Ans c)

13) Fourier sine Transform of e^{-x} is:

a) $\sqrt{\frac{\pi}{2}}\,\frac{1}{s^2+1}$ b) $\sqrt{\frac{2}{\pi}}\,\frac{s^2}{s^2+1}$ c) $\sqrt{\frac{2}{\pi}}\,\frac{s}{s+1}$ d) $\sqrt{\frac{2}{\pi}}\,\frac{s}{s^2+1}$

Ans d)

14) The kernel of Fourier transform is

a) $\frac{1}{\sqrt{2\pi}}e^{isx}$ b) $\frac{1}{\sqrt{2\pi}}e^{-isx}$ c) $\frac{1}{\sqrt{2\pi}}e^{sx}$ d) $\frac{1}{\sqrt{2\pi}}e^{-sx}$

Ans a)

15) The kernel of Fourier sine transform is

a) $\sqrt{\frac{2}{\pi}}\sin(sx)$ b) $\sqrt{\frac{1}{\pi}}\sin(sx)$

c) $\frac{1}{\sqrt{2\pi}}\sin(sx)$ d) None of these

Ans a)

Unit-III

Calculus of Variations

Q. 1. The extremals of the functional $\int_a^b \frac{1+y'^2}{y'^2}\,dx$ is

a) Circle

b) Straight line

c) Ellipse

d) none of these

Ans Option b)

Q. 2. Euler's equation for $F(x,y,y')$ is

a) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$

b) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

c) $\frac{dF}{dy} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$

d) $\frac{dF}{dy} - \frac{d}{dx}\left(\frac{dF}{dy'}\right) = 0$

Ans Option b)

Q. 3. Euler's equation for $F(x,y,y',y'')$ is

a) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) + \frac{d^2}{dx^2}\left(\frac{\partial F}{\partial y''}\right) = 0$

b) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

c) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) - \frac{d^2}{dx^2}\left(\frac{\partial F}{\partial y''}\right) = 0$

d) $\frac{\partial F}{\partial y} + \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

Ans Option a)

Q. 4. The shortest distance between two points in a plane is

a) Parabola

b) circle

c) Straight line

d) ellipse

Ans Option c)

Q. 5. The necessary condition for $\int_{x_1}^{x_2} F(x, y, y')dx$ to be maximum of minimum is

a) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$ b) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

c) $\frac{dF}{dy} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$ d) $\frac{dF}{dy} - \frac{d}{dx}\left(\frac{dF}{dy'}\right) = 0$

Ans Option b)

Q. 6. When F is independent of x and y then it is

a) circle b) straight line

c) Ellipse d) Parabola

Ans Option b)

7. What is the extremal of the functional $v[y(x)] = \int_{x_0}^{x_1} \frac{y'^2}{x^3} dx$

a) $y = ax + b$ b) $y = ax^2 + b$ c) $y = ax^4 + b$ d) $y = ax + bx^2$

Ans c)

8. When F is independent of x then

a) $\frac{\partial F}{\partial x} = 0$ b) $\frac{\partial F}{\partial y} = 0$ c) $\frac{dF}{dx} = 0$ d) $\frac{dF}{dy} = 0$

Ans a)

9. The extremal of the functional $I[y(x)] = \int_0^1 (2x - xy - y')\, y' dx$ is

a) $2y'' + y = 2$ b) $2y'' - y = 2$ c) $y'' + 2y = 2$ d) $y'' - 2y = 2$

Ans a)

10. Which is the Euler's equation for maximizing or minimizing the functional?

a) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$ b) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

c) $\frac{dF}{dy} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$ d) $\frac{dF}{dy} - \frac{d}{dx}\left(\frac{dF}{dy'}\right) = 0$

Ans b)

11. What is the formula to find the curve passing through the points (x_1, y_1) *and* (x_2, y_2) which when rotated about X-axis gives minimum surface area?

a) $\int_{x_1}^{x_2} 2\pi y\sqrt{1+(y')^2}\,dx$ b) $\int_{x_1}^{x_2} 2\pi\sqrt{1+(y')^2}\,dx$

c) $\int_{x_1}^{x_2} \pi y\sqrt{1+(y')^2}\,dx$ d) $\int_{x_1}^{x_2} 2y\sqrt{1+(y')^2}\,dx$

Ans a)

12. The Euler's equation for the functional $V\{y(x)\} = \int_0^1 [1+y''^2]dx$ is

a) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) + \frac{d^2}{dx^2}\left(\frac{\partial F}{\partial y''}\right) = 0$ b) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

c) $\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) - \frac{d^2}{dx^2}\left(\frac{\partial F}{\partial y''}\right) = 0$ d) $\frac{\partial F}{\partial y} + \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$

Ans a)

13. If $F(x, y, y')$ is independent of x then

a) $F - y'\frac{\partial F}{\partial y} = constant$ b) $F - y\frac{\partial F}{\partial y} = constant$

c) $F + y'\frac{\partial F}{\partial y} = constant$ d) $F + y\frac{\partial F}{\partial y} = constant$

Ans a)

14. The another form of Euler's equation is

a) $\frac{d}{dx}\left[F - y\frac{\partial F}{\partial y'}\right] - \frac{\partial F}{\partial x} = 0$ b) $\frac{d}{dx}\left[F - y'\frac{\partial F}{\partial y'}\right] = 0$

c) $\frac{d}{dx}\left[F - y'\frac{\partial F}{\partial y'}\right] - \frac{\partial F}{\partial x} = 0$ d) $\frac{d}{dx}\left[F - \frac{\partial F}{\partial y'}\right] - \frac{\partial F}{\partial x} = 0$

Ans c)

15. The third form of Euler's equation is

a) $\frac{\partial F}{\partial y} - \frac{\partial^2 F}{\partial x \partial y'} - \frac{\partial^2 F}{\partial y \partial y'} - \frac{\partial^2 F}{\partial y'^2} = 0$ b) $\frac{\partial F}{\partial y} - \frac{\partial^2 F}{\partial x \partial y} - \frac{\partial^2 F}{\partial x \partial y'} - \frac{\partial^2 F}{\partial y'^2} = 0$

c) $\frac{\partial F}{\partial y} - \frac{\partial^2 F}{\partial x \partial y} - y'\frac{\partial^2 F}{\partial x \partial y'} - y''\frac{\partial^2 F}{\partial y'^2} = 0$ d) $\frac{\partial F}{\partial y} - \frac{\partial^2 F}{\partial x \partial y'} - y'\frac{\partial^2 F}{\partial y \partial y'} - y''\frac{\partial^2 F}{\partial y'^2} = 0$

Ans d)

Unit IV
Functions of Complex Variable

1 $\oint \frac{4-3z}{z(z-1)(z-2)} dz$ =? where c is the circle $|z| = \frac{3}{2}$

a) 2πi b) πi c) 4πi d) -2πi

Ans a)

2 If f(z) is analytic inside and on the boundary of closed curve c and

a is the point within c then $\oint \frac{f(z)}{(z-a)} dz$=?

a) 2πif(a) b) f(a) c) 4πif(a) d) πif(a)

Ans a)

3 If f(z) is regular function of z then $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2$ =?

a) $4|f'(z)|^2$ b) f(z) c) $|f'(z)|^2$ d) 4f(z)

Ans a)

4 $\oint \frac{3z^2+1}{z^2-1} dz$ where c is the circle $|z| = 2$

a) 2 b) 1 c) 0 d) 4

Ans c)

5 Which of the following is real part of function $f(z) = z^2 + 3z$ at z= 1+ i

a) -3 b) 3 c) 5 d) 2

Ans b)

6 Which of the following is true ?

(a) sin ix=sinh x (b) sinh ix=sin x (c) tanh ix=tan x (d) cosh ix=cosx

Ans d)

7 Let z be a complex number and log z = $\frac{i\pi}{2}$ then z=?

(a) 2i (b) -2i (c) –I (d) i

And d)

8 Which f the following is true for $f(z) = |f(z)|^2$

a) f(z) is nowhere analytic. b) f (z) is differentiable at z=0
c) Both A and B are true. d) f(z) is analytic everywhere

Ans d)

9 For what values of $z = x + iy$ is the function f (z) = $3x^2+iy^2$ analytic ?

a) $y = x$ b) $y = -x$ c) $y = 3x$ d) $y = 2x$

Ans c)

10. If $f(z) = u + iv$ is an analytic function then

a) u is harmonic function b) v is harmonic function c) both a and b d) None of these

Ans c)

11. If $f(z) = u + iv$ is an analytic function then the Cauchy-Riemann condition is

a) $u_x = -v_y \; and \; u_y = v_x$ b) $u_x = v_y \; and \; u_y = -v_x$

c) both a and b c) None of these

Ans b)

12. If $f(z) = u + iv$ is an analytic function and u is given then to find $f(z)$ we use

a) $f'(z) = u + iv$ b) $f'(z) = \frac{\partial u}{\partial x} + i\frac{\partial v}{\partial y}$

c) $f'(z) = \frac{\partial u}{\partial x} + i\frac{\partial v}{\partial x}$ d) None of these

Ans c)

13. If $f(z) = u + iv$ is an analytic function then the polar form of Cauchy-Riemann equation is

a) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta} \; and \; \frac{\partial u}{\partial r} = \frac{-1}{r}\frac{\partial v}{\partial \theta}$ b) $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta} \; and \; \frac{\partial v}{\partial r} = \frac{-1}{r}\frac{\partial u}{\partial \theta}$

c) $\frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial u}{\partial \theta} \; and \; \frac{\partial u}{\partial r} = \frac{-1}{r}\frac{\partial v}{\partial \theta}$ d) $\frac{\partial v}{\partial r} = \frac{1}{r}\frac{\partial u}{\partial \theta} \; and \; \frac{\partial v}{\partial r} = \frac{-1}{r}\frac{\partial u}{\partial \theta}$

Ans b)

14. If $f(z)$ is analytic function then residue of f(z) at simple pole $z = a$ is

a) $\lim_{x \to a}(z-a)f(z)$ b) $\lim_{x \to a}(z+a)f(z)$

c)) $\lim_{x \to a}(z-a)f'(z)$ d) $\lim_{x \to a}(z+a)f'(z)$

Ans a)

15. If $f(z) = \bar{z}$ then

a) analytic function b) non-analytic function c) harmonic function d) None of these

Ans b)

Unit-V

Partial Differential Equations

Q.1 ---------- is called Lagrange's linear partial differential equation.

a) Pp+Qq=R b) Pq+Qp =R

c) Pp-Qq =R d) Pp+Qq= -R

Ans a)

Q.2 $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 0$ is the Homogenous equation of degree--------

a) 2 b) 3 c) 1 d) 0

Ans b)

Q.3 Which of the following is Homogenous equation of degree 2.

a). $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 0$ b). $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial y^2} = 0$

c). $\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^2 z}{\partial y^2} = 0$ d). $\frac{\partial^4 z}{\partial x^4} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 0$

Ans b)

Q.4. Complete solution of Partial Differential equation is given by_____.

a) C.F. b) P.I. c) C.F.+ P.I. d) C.F. * P.I.

Ans c)

Q.5 . $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ is called _____.

a) Lagrange's Auxillary equation b) Laurent equation.

c) Euler's equation d) Lagrange's equation.

Ans a)

Q.6 $(1-x)^{-1}$ = ?

a) $1-x+x^2-\cdots+(-1)^n x^n$ b) $1+x+x^2+\cdots+x^n$

c) $1+x+x^2+\cdots+(-1)^n x^n$ d) $x+x^2+\cdots+x^n$

Ans b)

Q.7. What is the C.F. of $\frac{\partial^2 z}{\partial x^2}-16\frac{\partial^2 z}{\partial y^2}=0$

a) $\emptyset_1(y+x)+\emptyset_2(y-x)$ b) $\emptyset_1(y+4x)+\emptyset_2(y-4x)$

c) $\emptyset_1(y-x)+\emptyset_2(y+4x)$ d) $\emptyset_1(y+4x)+\emptyset_2(y-x)$

Ans b)

Q. 8. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2}-7\frac{\partial^2 z}{\partial x\partial y}=sinx$ is

a) $\varphi_1(y-7x)+\varphi_2(y)$ b) $\varphi_1(y+7x)+\varphi_2(y)$

c) $\varphi_1(y+7x)+x\varphi_2(y)$ d) $\varphi_1(y+7x)+x\varphi_2(y+x)$

Ans b)

Q. 9. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2}-2\frac{\partial^2 z}{\partial x\partial y}=sin3x+\cos 3x$ is

a) $\varphi_1(y+x)+\varphi_2(y)$ b) $\varphi_1(y+x)+\varphi_2(2y)$

c) $\varphi_1(y+2x)+\varphi_2(y)$ d) $\varphi_1(y+x)+x\varphi_2(y+x)$

Ans c)

Q. 10. The P. I. of the partial differential equation $(D^2-2DD'+D'^2)z=\tan(x+y)$ is

a) $tan\ (x+y)$ b) $x\ tan(x+y)$

c) $\frac{x}{2}\tan(x+y)$ d) $\frac{x^2}{2}\tan(x+y)$

Ans d)

Q. 11. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} = sinx\ cos2y$ is

a) $\varphi_1(y+x) + \varphi_2(y)$ b) $\varphi_1(y+x) + \varphi_2(y+x)$

c) $\varphi_1(y+x) + x\varphi_2(y)$ d) $\varphi_1(y+x) + x\varphi_2(y+x)$

Ans a)

Q. 12. One of the solution of Lagrange's linear equation $p + 3q = 5z + tan(y - 3x)$ is

a) $y = 3x$ b) $y - 3x = constant$

c) $y + 3x = constant$ d) $y = -3x$

Ans b)

Q. 13. A partial differential equation requires

a) Exactly one independent variable b) two or more independent variables

c) More than one dependent variable d) equal number of dependent and independent variables

Ans b)

Q. 14. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = e^{x+3y}$ is

a) $\varphi_1(y+x) + \varphi_2(y+2x)$ b) $\varphi_1(y+x) + \varphi_2(y)$

c) $\varphi_1(y+x) + \varphi_2(y-2x)$ d) $\varphi_1(y+x) + \varphi_2(2y)$

Ans a)

Q. 15. The P. I. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = e^{2x+3y}$ is

a) e^{2x+3y} b) $4e^{2x+3y}$

c) $\frac{1}{4}\ e^{2x+3y}$ d) $2e^{2x+3y}$

Ans c)

Q. 16. The P. I. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = \sin(x - 2y)$ is

a) $sin(x - 2y)$ b) $-sin(x - 2y)$

c) 15 $sin(x - 2y)$ d) $\frac{-1}{15} sin(x - 2y)$

Ans d)

Q. 17. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 25\frac{\partial^2 z}{\partial y^2} = e^{2x+4y}$ is

a) $\varphi_1(y + 5x) + \varphi_2(y - 5x)$ b) $\varphi_1(y + x) + \varphi_2(y - 5x)$

c) $\varphi_1(y + 5x) + \varphi_2(y - x)$ d) $\varphi_1(y + 5x) + x\varphi_2(y - 5x)$

Ans a)

Q. 18. The C. F. of partial differential equation $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x}$ is

a) $\varphi_1(y + 2x) + \varphi_2(y) + x\varphi_3(y)$ b) $\varphi_1(y + 2x) + \varphi_2(y) + \varphi_3(y)$
c) $\varphi_1(y + x) + \varphi_2(y) + x\varphi_3(y)$ d) $\varphi_1(y + x) + \varphi_2(y) + \varphi_3(y)$

Ans a)

Q. 19. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \tan(x + 3y)$ is

a) $\varphi_1(y + 2x) + \varphi_2(y - 2x)$ b) $\varphi_1(y + x) + x\varphi_2(y + x)$

c) $\varphi_1(y + 2x) + \varphi_2(y - x)$ d) $\varphi_1(y + x) + x\varphi_2(y - x)$

Ans b)

Q. 20. The C. F. of partial differential equation $\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{4x+3y}$ is

a) $\varphi_1(y + 4x) + \varphi_2(y) + x\varphi_3(y)$ b) $\varphi_1(y + 2x) + \varphi_2(y) + \varphi_3(y)$
c) $\varphi_1(y + 2x) + \varphi_2(y) + x\varphi_3(y)$ d) $\varphi_1(y + 4x) + \varphi_2(y) + \varphi_3(y)$

Ans a)

Q. 21. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 9\frac{\partial^2 z}{\partial x \partial y} = \sin(2x + y)$ is

a) $\varphi_1(y + x) + \varphi_2(y)$ b) $\varphi_1(y + 9x) + \varphi_2(y)$

c) $\varphi_1(y + x) + x\varphi_2(y)$ d) $\varphi_1(y + 9x) + x\varphi_2(y + x)$

Ans b)

Q. 22.The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 21\frac{\partial^2 z}{\partial x \partial y} = \cos 3x + sinx$ is

a) $\varphi_1(y + x) + \varphi_2(y)$ b) $\varphi_1(y + 3x) + \varphi_2(y)$

c) $\varphi_1(y + 21x) + \varphi_2(y)$ d) $\varphi_1(y + 21x) + x\varphi_2(y + x)$

Ans c)

Q. 23. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 7\frac{\partial^2 z}{\partial x \partial y} = sinx\ cos2y$ is

a) $\varphi_1(y + 7x) + \varphi_2(y)$ b) $\varphi_1(y + x) + \varphi_2(y + x)$

c) $\varphi_1(y + x) + x\varphi_2(y)$ d) $\varphi_1(y + 7x) + x\varphi_2(y + x)$

Ans a)

Q. 24. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} = cos2y$ is

a) $\varphi_1(y - 2x) + \varphi_2(y)$ b) $\varphi_1(y + 2x) + \varphi_2(y + x)$

c) $\varphi_1(y + 2x) + x\varphi_2(y)$ d) $\varphi_1(y - 2x) + x\varphi_2(y + x)$

Ans a)

Q. 25. The C. F. of partial differential equation $\frac{\partial^3 z}{\partial x^3} - 5\frac{\partial^3 z}{\partial x^2 \partial y} = 2e^{2x+3y}$ is

a) b) $\varphi_1(y + 2x) + \varphi_2(y) + \varphi_3(y)$ b) $\varphi_1(y + 5x) + \varphi_2(y) + \varphi_3(y)$

c) $\varphi_1(y + 3x) + \varphi_2(y) + x\varphi_3(y)$ d) $\varphi_1(y + 5x) + \varphi_2(y) + x\varphi_3(y)$

Ans d)

Q. 26. The C. F. of partial differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} - 2\frac{\partial^3 z}{\partial y^3} = \cos(x + 2y)$ is

a) $\varphi_1(y + 2x) + \varphi_2(y - x) + x\varphi_3(y - x)$ b) $\varphi_1(y + 5x) + \varphi_2(y) + \varphi_3(y)$
c) $\varphi_1(y + 3x) + \varphi_2(y) + x\varphi_3(y)$ d) $\varphi_1(y + x) + \varphi_2(y) + x\varphi_3(y)$

Ans a)

Q. 27. The C. F. of partial differential equation $\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^2 \partial y} = xy$ is

a) $\varphi_1(y + 2x) + \varphi_2(y) + x\varphi_3(y)$ b) $\varphi_1(y + x) + \varphi_2(y) + \varphi_3(y)$
c) $\varphi_1(y + 3x) + \varphi_2(y) + x\varphi_3(y)$ d) $\varphi_1(y + x) + \varphi_2(y) + x\varphi_3(y)$

Ans a)

Q. 28. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + 3\frac{\partial^2 z}{\partial y^2} = \sqrt{4x + 3y}$ is

a) $\varphi_1(y + 7x) + \varphi_2(y)$ b) $\varphi_1(y + x) + \varphi_2(y + 3x)$

c) $\varphi_1(y + x) + x\varphi_2(y)$ d) $\varphi_1(y + x) + x\varphi_2(y + x)$

Ans b)

Q. 29. The C. F. of partial differential equation $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} = \sqrt{2x + 3y}$ is

a) $\varphi_1(y + x) + \varphi_2(y)$ b) $\varphi_1(y + x) + \varphi_2(y + 3x)$
c) $\varphi_1(y) + x\varphi_2(y - x)$ d) $\varphi_1(y + x) + x\varphi_2(y + x)$

Ans c)

Q. 30. The C. F. of partial differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} - 2\frac{\partial^3 z}{\partial y^3} = \cos(2x + 3y)$ is

a) $\varphi_1(y + 2x) + \varphi_2(y) + x\varphi_3(y)$
b) b) $\varphi_1(y + 2x) + \varphi_2(y - x) + x\varphi_3(y - x)$
c) $\varphi_1(y + 3x) + \varphi_2(y) + x\varphi_3(y)$

d) $\varphi_1(y + x) + \varphi_2(y) + x\varphi_3(y)$

Ans b)

Q. 31. If -2 and -3 are two roots of the partial differential equation then its C. F is

a) $\varphi_1(y+2x)+\varphi_2(y+3x)$ b) $\varphi_1(y+2x)+x\varphi_2(y+3x)$

c) $\varphi_1(y-2x)+\varphi_2(y-3x)$ d) $\varphi_1(y-2x)+x\varphi_2(y-3x)$

Ans c)

Q. 32. If 5, 5, 5 are three roots of the partial differential equation then its C. F is

a) $\varphi_1(y+5x)+x\varphi_2(y+5x)+x\varphi_3(y+5x)$

b) $\varphi_1(y+5x)+x\varphi_2(y+5x)+x^2\varphi_3(y+5x)$

c) $\varphi_1(y+5x)+\varphi_2(y+5x)+x\varphi_3(y+5x)$

d) $\varphi_1(y+5x)+x\varphi_2(y+5x)+\varphi_3(y+5x)$

Ans b)

Q. 33. If 6, 3, 3 are three roots of the partial differential equation then its C. F is

a) $\varphi_1(y+6x)+\varphi_2(y+3x)+x\varphi_3(y+3x)$

b) $\varphi_1(y+6x)+x\varphi_2(y+3x)+x^2\varphi_3(y+3x)$

c) $\varphi_1(y+3x)+\varphi_2(y+6x)+x\varphi_3(y+6x)$

d) $\varphi_1(y+3x)+x\varphi_2(y+6x)+\varphi_3(y+6x)$

Ans a)

Q. 34. If 2, 2, 4 are three roots of the partial differential equation then its C. F is

a) $\varphi_1(y+4x)+x\varphi_2(y+2x)+\varphi_3(y+2x)$

b) $\varphi_1(y+4x)+x\varphi_2(y+2x)+x^2\varphi_3(y+2x)$

c) $\varphi_1(y+4x)+\varphi_2(y+2x)+\varphi_3(y+2x)$

d) $\varphi_1(y+2x)+\varphi_2(y+2x)+x\varphi_3(y+4x)$

Ans a)

Q. 35. If 1, 1 are two roots of the partial differential equation then its C. F is

a) $\varphi_1(y+x)+x\varphi_2(y+x)$ b) $\varphi_1(y+x)+x^2\varphi_2(y+x)$

c) $\varphi_1(y+x)+\varphi_2(y+x)$ d) $\varphi_1(y+x)+x\varphi_2(y-x)$

Ans a)

Q. 36. If 0, 0 are two roots of the partial differential equation then its C. F is

a) $\varphi_1(y+x)+x\varphi_2(y+x)$ b) $\varphi_1(y+x)+\varphi_2(y)$

c) $\varphi_1(y+x)+\varphi_2(y+x)$ d) None of these

Ans d)

Q. 37. If right hand side of given partial differential equation is zero then its P. I. is

a) 1 b) 2 c) 0 d) None of these

Ans c)

Q. 38. The second order partial differential equation $u_{xx}+4u_{xy}+u_{yy}=0$ is

a) Elliptic b) Parabolic c) Hyperbolic d) None of these

Ans c)

Q. 39. The Laplace equation $\frac{\partial^2 u}{\partial t^2}+\frac{\partial^2 u}{\partial x^2}=0$ is

a) Elliptic b) Parabolic c) Hyperbolic d) None of these

Ans a)

Q. 40. A first order partial differential equation $(x-yz)p+(y-zx)q=z-xy$ is

a) Linear equation b) Semi linear equation c) Quasi linear equation d) Non linear equation

Ans c)

Unit-VI

Matrices

1. Eigen values of the matrix A= $\begin{bmatrix} 0 & 1 \\ -4 & 0 \end{bmatrix}$ are

a) $2i, -2i$ b) 2i c) $1, -4$ d) $-2i, 1$

Ans a)

2. The sum of Eigen values of matrix A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ is

a) 5 b) 7 c) 4 d) 0

Ans b)

3. Eigen values the matrix are A= $\begin{bmatrix} 3 & 10 \\ 1 & 0 \end{bmatrix}$ are

a)2,5 b) -2,5 c) 0,5 d) -2 , -5

Ans b)

4. Are the vectors Linearly independent? X 1={1,1,1} , X2={1,2,3} , X3={2,3,8}

a) Linearly independent b) Linearly dependent c) can't say d) dependent

Ans:- a)

5. If $a + b + 2c = 0$ and $a + 2b + 3c = 0$ then a, b, and c are

a) 1, 1, -1 b) 1, 2 , 3 c) 1, 2, 1 d) 1, -1 , -1

Ans a)

6. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ then eigen values are

a) $-4, 1$ b) $4, -1$ c) 4, 1 d) $-4, -1$

Ans b)

7. If $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 & 2 \\ 0 & 2 & -1 \\ 2 & 0 & 1 \end{bmatrix}$ then $B^{-1}AB$ is

a) $\begin{bmatrix} 8 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ c) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 8 \end{bmatrix}$ d) none of these

Ans c)

8. If $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ the value of S_2 is

a) 12 b) 24 c) 6 d) 36

Ans d)

9. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$ then

a) $A^2 - 5A - 6I = 0$ b) $A^2 + 5A - 6I = 0$ c) $A^2 - 5A + 6I = 0$ d) $A^2 + 5A + 6 = 0$

Ans c)

10. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ then $sec^2 A - tan^2 A = --$

a) 1 b) A c) d) I

Ans d)

11. $M = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ then value of $M^2 - 3M + I$ is

a) $\begin{bmatrix} 2 & 3 \\ 9 & 8 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ c) $\begin{bmatrix} 4 & 1 \\ 9 & 16 \end{bmatrix}$ d) $\begin{bmatrix} 4 & -1 \\ -3 & 2 \end{bmatrix}$

Ans a)

12. If $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ then A^2 is

a) $4A - 5I$ b) $4A + 2I$ c) $4A + 5I$ d) $4A - 2I$

Ans c)

13. If $M = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ then e^M = -------

a) $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$ b) $\begin{bmatrix} e^a & 0 \\ 0 & e^b \end{bmatrix}$ c) $\begin{bmatrix} M^a & 0 \\ 0 & M^b \end{bmatrix}$ d) none of these

Ans b)

14. Which of the following Statement is true

a) Every matrix satisfied its own characteristic equation.
b) Every matrix satisfied characteristic equation
c) Every square matrix satisfied its own characteristic equation
d) Every square matrix satisfied characteristic equation.

Ans c)

15. If $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ then its eigen values are

a) $5, -3$ b) $5, -3, -3$ c) $-3, 5$ d) $-3, 5, 5$

Ans b)

13. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ then A^4 is

a) $\begin{bmatrix} 81 & 16 \\ 1 & 256 \end{bmatrix}$ b) $\begin{bmatrix} 219 & 406 \\ 201 & 420 \end{bmatrix}$ c) $\begin{bmatrix} 219 & 406 \\ 203 & 422 \end{bmatrix}$ d) $\begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$

Ans c)

16. If $A = \begin{bmatrix} 1 & 0 & 4 \\ 0 & 2 & 0 \\ 3 & 1 & -3 \end{bmatrix}$ then the spectral radius is

a) 3 b) 5 c) 4 d) 2

Ans b)

17. If $a + 2b - 3d = 0, 2a - b + c + 7d = 0, 4a + 3b + 2c + 2d = 0$

then a, b, c and d are

a) $9, 12, 5, -5$ b) $9, -12, 5, 5$ c) $-9, 12, -5, -5$ d) $9, -12, 5, -5$

Ans d)

18. The product of eigen values of the matrix A is $A = \begin{bmatrix} 2 & 0 & 1 \\ 4 & -3 & 3 \\ 0 & 2 & -1 \end{bmatrix}$

a) -6 b) 2 c) 6 d) -2

Ans b)

19. Consider a 3 by 3 matrix with every element being equal to 1.
Its only non zero eigen value is

a) 2 b) 1 c) 4 d) 3

Ans d)

20. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$ then A^{50} is

a) $\begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 0 \\ 0 & 3^{50} \end{bmatrix}$ c) $\begin{bmatrix} 3 & 0 \\ 0 & 1 \end{bmatrix}$ d) None of these

Ans b)

21. If $A = \begin{bmatrix} 4 & 1 \\ -8 & -5 \end{bmatrix}$ then the eigen values are

a) $3, -4$ b) $4, -5$ c) $3, 4$ d) $4, 5$

Ans a)

22.The product of the eigen values of the matrix $A = \begin{bmatrix} 4 & 1 \\ -8 & -5 \end{bmatrix}$ is

a) -20 b) -12 c) 20 d) 12

Ans b)

23. The sum of the eigen values of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 4 & -3 & 3 \\ 0 & 2 & -1 \end{bmatrix}$ is

a) 2 b) 1 c) -2 d) -1

Ans c)

24. If $A = \begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$ then the characteristic equation is

a) $\lambda^3 - 2\lambda^2 - \lambda + 2 = 0$ b) $\lambda^3 + 2\lambda^2 - \lambda + 2 = 0$

c) $\lambda^3 - 2\lambda^2 + \lambda + 2 = 0$ d) $\lambda^3 + 2\lambda^2 + \lambda + 2 = 0$

Ans a)

25. If $A = \begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$ then the eigen values are

a) 2, 1, 1 b) 2, 2, 1 c) $2, 1, -1$ d) $2, -2, -1$

Ans c)