SRM OF INSTITUTE OF SCIENCE AND TECHNOLOGY
FACULTY OF ENGINEERING AND TECHNOLOGY
18MAB102T- ADVANCED CALCULUS AND COMPLEX ANALYSIS
PART - A : MULTIPLE CHOICE QUESTIONS

UNIT – I: MULTIPLE INTEGRALS

1. Evaluation of $\int_0^1 \int_0^1 dxdy$ is

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

2. The curve $y^2 = 4x$ is a

   (a) parabola (b) hyperbola (c) straight line (d) ellipse

3. Evaluation of $\int_0^\pi \int_0^\pi d\theta d\phi$ is

   $a)\ 1 \quad b)\ 0 \quad c)\ \pi/2 \quad d)\ \pi^2$

4. The area of an ellipse is

   $a)\ \pi r^2 \quad b)\ \pi a^2 b \quad c)\ \pi ab^2 \quad d)\ \pi ab$

5. $\int_1^b \int_1^a \frac{dxdy}{xy}$ is equal to

   a) $\log a + \log b$ b) $\log a$ c) $\log b$ d) $\log a \log b$

6. $\int_0^1 \int_0^x dxdy$ is equal to

   $a)\ 1 \quad b)\ 1/2 \quad c)\ 2 \quad d)\ 3$

7. $\int_0^1 \int_0^2 dxdy$ is equal to

   $a)\ \int_0^2 \int_0^1 dydx \quad b)\ -\int_0^1 \int_0^2 dxdy \quad c)\ \int_2^0 \int_0^1 dydx \quad d)\ \int_1^0 \int_0^2 dydx$

8. If R is the region bounded $x = 0,\ y = 0,\ x + y = 1$ then $\iint_R dxdy$ is equal to

   $a)\ 1 \quad b)\ 1/2 \quad c)\ 1/3 \quad d)\ 2/3$

9. Area of the double integral in cartesian co-ordinate is equal to

   $a)\ \iint_R dydx \quad b)\ \iint_R rdrd\theta \quad c)\ \iint_R xdxdy \quad d)\ \iint_R x^2 dxdy$

10. Change the order of integration in $\int_0^a \int_0^x dxdy$ is

$a) \int_0^a \int_0^x dxdy \quad b) \int_0^a \int_0^x xdydx \quad c) \int_0^a \int_y^a dxdy \quad d) \int_0^a \int_0^y dxdy$

11. Area of the double integral in polar co-ordinate is equal to

$a) \iint_R drd\theta \quad b) \iint_R r^2 drd\theta \quad c) \iint_R (r+1)drd\theta \quad d) \iint_R rdrd\theta$

12. $\int_0^1 \int_0^2 \int_0^3 dxdydz$ is equal to

$a)\ 3 \quad b)\ 4 \quad c)\ 2 \quad d)\ 6$

13. The name of the curve $r = a(1+\cos\theta)$ is

a) lemniscate b) cycloid c) cardioid d) hemicircle

14. The volume integral in cartesian coordinates is equal to

$a) \iiint_V dxdydz \quad b) \iiint_V drd\theta d\phi \quad c) \iint_R drd\theta \quad d) \iint_R rdrd\theta$

15. $\int_0^1 \int_0^2 x^2 ydxdy$ is equal to

$a) \frac{2}{3} \quad b) \frac{1}{3} \quad c) \frac{4}{3} \quad d) \frac{8}{3}$

16. $\int_0^1 \int_0^1 (x+y)dxdy$ is equal to

$a)\ 1 \quad b)\ 2 \quad c)\ 3 \quad d)\ 4$

17. After changing the double integral $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dxdy$ into polar coordinates, we have

$a) \int_0^{\pi/2} \int_0^\infty e^{-r^2} drd\theta \quad b) \int_0^{\pi/4} \int_0^\infty e^{-r} drd\theta \quad c) \int_0^{\pi/2} \int_0^\infty e^{-r^2} rdrd\theta \quad d) \int_0^{\pi/2} \int_0^\infty e^{-r} drd\theta$

18. $\int_0^\infty \int_0^y \frac{e^{-y}}{y} dxdy$ is equal to

$a)\ 1 \quad b)\ 0 \quad c)\ -1 \quad d)\ 2$

19. The value of the integral $\int_0^2 \int_0^1 xydxdy$ is

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

20. The value of the integral $\int_0^{\pi/2}\int_0^{\pi/2} \sin(\theta+\phi)d\theta d\phi$

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

21. The region of integration of the integral $\int_{-b}^{b}\int_{-a}^{a} f(x,y)dxdy$ is

(a) square (b) circle (c) rectangle (d) triangle

22. The region of integration of the integral $\int_0^1\int_0^x f(x,y)dxdy$ is

(a) square (b) rectangle (c) triangle (d) circle

23. The limits of integration is the double integral $\iint_R f(x,y)dxdy$, where R is in the first quadrant and bounded by $x=0,\ y=0,\ x+y=1$ are

$(a)\ \int_{x=0}^{1}\int_{y=0}^{1-x} f(x,y)dydx$ $(b)\ \int_{y=1}^{2}\int_{x=0}^{1-y} f(x,y)dxdy$

$(c)\ \int_{y=0}^{1}\int_{x=1}^{y} f(x,y)dxdy$ $(d)\ \int_{y=0}^{2}\int_{x=0}^{1-y} f(x,y)dxdy$

ANSWERS:

1	a	6	b	11	d	16	a	21	c
2	a	7	a	12	d	17	c	22	c
3	d	8	b	13	c	18	a	23	a
4	d	9	a	14	a	19	a		
5	d	10	c	15	c	20	b		

UNIT – II: VECTOR CALCULUS

1. The directional derivative of $\phi = xy + yz + zx$ at the point (1,2,3) along x- axis is
   (a) 4 (b) 5 (c) 6 (d) 0

2. In what direction from (3, 1, -2) is the directional derivative of $\phi = x^2 y^2 z^4$ maximum?
   a) $\frac{1}{\sqrt{19}}(\vec{i} + 3\vec{j} - \vec{k})$ (b) $19(\vec{i} + 3\vec{j} - 3\vec{k})$
   (c) $96(\vec{i} + 3\vec{j} - 3\vec{k})$ d) $\frac{1}{\sqrt{19}}(3\vec{i} + 3\vec{j} - \vec{k})$

3. If $\vec{r}$ is the position vector of the point (x, y, z) w. r. to the origin, then $\nabla \cdot \vec{r}$ is
   (a) 2 (b) 3 (c) 0 (d) 1

4. If $\vec{r}$ is the position vector of the point (x, y, z) w. r. to the origin, then $\nabla \times \vec{r}$ is
   a) $\nabla \times \vec{r} = 0$ b) $x\vec{i} + y\vec{j} + z\vec{k} = 0$ c) $\nabla \times \vec{r} \neq 0$ d) $\vec{i} + \vec{j} + \vec{k} = 0$

5. The unit vector normal to the surface $x^2 + y^2 - z^2 = 1$ at (1, 1, 1) is
   a) $\frac{\vec{i} + \vec{j} - \vec{k}}{\sqrt{3}}$ b) $\frac{2\vec{i} + 2\vec{j} - 2\vec{k}}{\sqrt{2}}$ c) $\frac{3\vec{i} + 3\vec{j} - 3\vec{k}}{2\sqrt{3}}$ d) $\frac{\vec{i} + \vec{j} - \vec{k}}{3\sqrt{2}}$

6. If $\phi = xyz,$ then $\nabla\phi$ is
   a) $yz\vec{i} + zx\vec{j} + xy\vec{k}$ b) $xy\vec{i} + yz\vec{j} + zx\vec{k}$ c) $zx\vec{i} + xy\vec{j} + yz\vec{k}$ d) 0

7. If $\vec{F} = (x+3y)\vec{i} + (y-3z)\vec{j} + (x-2z)\vec{k}$ then $\vec{F}$ is
   a) solenoidal b) irrotational c) constant vector
   d) both solenoidal and irrotational

8. If $\vec{F} = \left(axy - z^3\right)\vec{i} + (a-2)x^2\vec{j} + (1-a)xz^2\vec{k}$ is irrotational then the value of a is
   a) 0 b) 4 c) -1 d) 2

9. If $\vec{u}$ and $\vec{v}$ are irrotational then $\vec{u} \times \vec{v}$ is
   a) solenoidal b) irrotational c) constant vector d) zero vector

10. If ϕ and ψ are scalar functions then $\nabla\phi\times\nabla\psi$ is
a) solenoidal b) irrotational c) constant vector
d) both solenoidal and irrotational

11. If $\vec{F}=\left(y^2-z^2+3yz-2x\right)\vec{i}+\left(3xz+2xy\right)\vec{j}+\left(3xy-2xz+2z\right)\vec{k}$ then $\vec{F}$ is
a) solenoidal b) irrotational c) both solenoidal and irrotational
d) neither solenoidal nor irrotational

12. If $\vec{a}$ is a constant vector and $\vec{r}$ is the position vector of the point (x, y, z) w. r. to the origin then $grad(\vec{a}\cdot\vec{r})$ is
a) 0 b) 1 c) $\vec{a}$ d) $\vec{r}$

13. If $\vec{a}$ is a constant vector and $\vec{r}$ is the position vector of the point (x, y, z) w. r. to the origin then $div(\vec{a}\times\vec{r})$ is
a) 0 b) 1 c) $\vec{a}$ d) $\vec{r}$

14. If $\vec{a}$ is a constant vector and $\vec{r}$ is the position vector of the point (x, y, z) w. r. to the origin then $curl(\vec{a}\times\vec{r})$ is
a) 0 b) 1 c) $2\vec{a}$ d) $2\vec{r}$

15. If ϕ scalar functions then $curl(grad\phi)$ is
a) solenoidal b) irrotational c) constant vector d) 0

16. If the value of $\int_A^B \vec{F}\cdot d\vec{r}$ does not depend on the curve C, but only on the terminal points A and B then $\vec{F}$ is called
a) solenoidal vector b) irrotational vector c) conservative vector
d) neither conservative nor irrotational

17. The condition for $\vec{F}$ to be Conservative is, $\vec{F}$ should be
a) solenoidal vector b) irrotational vector c) rotational
d) neither solenoidal nor irrotational

18. The value of $\int_C \vec{r} \cdot d\vec{r}$ where C is the line $y = x$ in the xy-plane from (1,1) to (2,2) is

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

19. The work done by the conservative force when it moves a particle around a closed curve is

a) $\nabla \cdot \vec{F} = 0$ b) $\nabla \times \vec{F} = 0$ c) 0 d) $\nabla \cdot (\nabla \times \vec{F}) = 0$

20. The connection between a line integral and a double integral is known as

a) Green's theorem b) Stoke's theorem c) Gauss Divergence theorem
d) convolution theorem

21. The connection between a line integral and a surface integral is known as

a) Green's theorem b) Stoke's theorem c) Gauss Divergence theorem
d) Residue theorem

22. The connection between a surface integral and a volume integral is known as

a) Green's theorem b) Stoke's theorem c) Gauss Divergence theorem
d) Cauchy's theorem

23. Using Gauss divergence theorem, find the value of $\iint_S \vec{r}\, \vec{ds}$ where $\vec{r}$ is the position vector and V is the volume

a) $4V$ b) 0 c) $3V$ d) volume of the given surface

24. If S is any closed surface enclosing the volume V and if $\vec{F} = ax\,\vec{i} + by\,\vec{j} + cz\,\vec{k}$ then the value of $\iint_S \vec{F} \cdot \vec{n}\, dS$ is

a) $abcV$ b) $(a+b+c)V$ c) 0 d) $abc(a+b+c)V$

ANSWERS:

1	b	6	a	11	c	16	c	21	b
2	c	7	a	12	c	17	b	22	c
3	b	8	b	13	a	18	d	23	c
4	a	9	a	14	a	19	c	24	b
5	a	10	a	15	d	20	a		

UNIT-III LAPLACE TRANSFORMS

1. L(1) =

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

2. $L(e^{3t}) =$

   $(a)\ \frac{1}{s+3}\qquad (b)\ \frac{1}{s-3}\qquad (c)\ \frac{3}{s+3}\qquad (d)\ \frac{s}{s-3}$

3. $L(e^{-at}) =$

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

4. $L(\cos 2t) =$

   $(a)\ \frac{s}{s^2+4}\qquad (b)\ \frac{s}{s^2+2}\qquad (c)\ \frac{2}{s^2+2}\qquad (d)\ \frac{4}{s^2+4}$

5. $L(t^4) =$

   $(a)\ \frac{4!}{s^5}\quad (b)\ \frac{3!}{s^4}\quad (c)\ \frac{4!}{s^4}\quad (d)\ \frac{5!}{s^4}$

6. $L(a^t) =$

   $(a)\ \frac{1}{s-\log a}\qquad (b)\ \frac{1}{s+\log a}\qquad (c)\ \frac{1}{s-a}\qquad (d)\ \frac{1}{s+a}$

7. $L(\sinh \omega t) =$

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

8. An example of a function for which the Laplace transforms does not exists is

   $(a)\ f(t)=t^2\quad (b)\ f(t)=\tan t\quad (c)\ f(t)=\sin t\qquad (d)\ f(t)=e^{-at}$

9. If $L(f(t)) = F(s)$, then $L(e^{-at}f(t)) =$

   $(a)\ F(s+a)\quad (b)\ F(s-a)\quad (c)\ F(s)\quad (d)\ \frac{1}{a}F\left(\frac{s}{a}\right)$

10. $L(e^{-at}\cos bt) =$

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

11. $L(te^{t}) =$

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

12. $L(t\sin at) =$

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

13. $L(\sin 3t) =$

$(a)\ \dfrac{3}{s^2+3}$ $(b)\ \dfrac{3}{s^2+9}$ $(c)\ \dfrac{s}{s^2+3}$ $(d)\ \dfrac{s}{s^2+9}$

14. $L(\cosh t) =$

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

15. $L(t^{1/2}) =$

$(a)\ \dfrac{\Gamma(3/2)}{s^{1/2}}$ $(b)\ \dfrac{\Gamma(1/2)}{s^{3/2}}$ $(c)\ \dfrac{\Gamma(1/2)}{s^{1/2}}$ $(d)\ \dfrac{\Gamma(3/2)}{s^{3/2}}$

16. $L(t^{-1/2}) =$

$(a)\ \sqrt{\dfrac{\pi}{s}}$ $(b)\ \sqrt{\dfrac{\pi}{2s}}$ $(c)\ \sqrt{\dfrac{1}{s}}$ $(d)\ \dfrac{1}{s}$

17. $L[te^{2t}] =$

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

18. If $L[f(t)] = F(s)$ then $L\left\{f\left(\dfrac{t}{a}\right)\right\}$ is

(a) $aF(as)$ (b) $\dfrac{1}{a}F\left(\dfrac{s}{a}\right)$ (c) $F(s+a)$ (d) $\dfrac{1}{a}F(as)$

19. $L\left(\int_0^t \sin t\,dt\right)$ is

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

20. $L(\sin t \cos t)$ is

(a) $L(\sin t)..L(\cos t)$ (b) $L(\sin t)+L(\cos t)$ (c) $L(\sin t)-L(\cos t)$ (d) $\frac{L(\sin 2t)}{2}$

21. If $L[f(t)]=F[s]$ then $L[tf(t)]=$

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

22. If $L[f(t)]=F[s]$ then $L\left[\frac{f(t)}{t}\right]=$

$(a)\ \int_0^\infty F(s)\,ds$ $(b)\ \int_s^\infty F(s)\,ds$ $(c)\ \int_{-\infty}^\infty F(s)\,ds$ $(d)\ \int_a^\infty F(s)\,ds$

23. $L\left[\frac{\cos t}{t}\right]=$

$(a)\ \frac{s}{s^2+a^2}$ $(b)\ \frac{1}{s^2+a^2}$ (c) *does not exist* $(d)\ \frac{s^2-a^2}{(s^2+a^2)^2}$

24. If $L[f(t)]=F[s]$ then $L[t^n f(t)]=$

$(a)\ (-1)^n \frac{d^n}{ds^n}F(s)$ $(b)\ \frac{d^n}{ds^n}F(s)$ $(c)\ -\frac{d^n}{ds^n}F(s)$ $(d)\ (-1)^{n-1}\frac{d^n}{ds^n}F(s)$

25. $L\left[\frac{1-e^{-t}}{t}\right]=$

$(a)\ \log\left(\frac{s}{s-1}\right)$ $(b)\ \log\left(\frac{s}{s+1}\right)$ $(c)\ \log\left(\frac{s+1}{s}\right)$ $(d)\ \log\left(\frac{s-1}{s}\right)$

26. $L(u_a(t))$ is

(a) $\frac{e^{as}}{s}$ (b) $\frac{e^{-as}}{s}$ (c) $-\frac{e^{-as}}{s}$ (d) $-\frac{e^{as}}{s}$

27. If $L[f(t)]=F[s]$ then $L[f'(t)]=$

(a) $sL[f(t)]-f(0)$ (b) $sL[f(t)]-sf(0)$ (c) $L[f(t)]-f(0)$ (d) $sL[f(t)]-f'(0)$

28. Using the initial value theorem, find the value of the function $f(t)=ae^{-bt}$

$(a)\ a$ $(b)\ a^2$ $(c)\ ab$ $(d)\ 0$

29. Using the initial value theorem, find the value of $f(t)=e^{-2t}\sin t$

$(a)\ 0$ $(b)\ \infty$ $(c)\ 1$ $(d)\ 2$

30. Using the initial value theorem, find the value of the function $f(t) = \sin^2 t$

$(a)\ 0 \quad (b)\ \infty \quad (c)\ 1 \quad (d)\ 2$

31. Using the initial value theorem, find the value of the function $f(t) = 1 + e^{-t} + t^2$

$(a)\ 2 \quad (b)\ 1 \quad (c)\ 0 \quad (d)\ \infty$

32. Using the initial value theorem, find the value of the function $f(t) = 3 - 2\cos t$

$(a)\ 3 \quad (b)\ 2 \quad (c)\ 1 \quad (d)\ 0$

33. Using the final value theorem, find the value of the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$

(a) 1 (b) 0 (c) ∞ (d) -2

34. Using the final value theorem, find the value of the function $f(t) = t^2 e^{-3t}$

(a) 0 (b) ∞ (c) 1 (d) -1

35. Using the final value theorem, find the value of the function $f(t) = 1 - e^{-at}$

$(a)\ 0 \quad (b)\ 1 \quad (c)\ 2 \quad (d)\ \infty$

36. The period of $\tan t$ is

(a) π (b) $\frac{\pi}{2}$ (c) 2π (d) $\frac{\pi}{4}$

37. The period of $|\sin \omega t|$ is

(a) $\frac{\pi}{\omega}$ (b) $\frac{2\pi}{\omega}$ (c) 2π (d) $2\pi\omega$

38. Inverse Laplace transform of $\frac{1}{(s-1)^2}$ is

(a) te^{-t} (b) te^{t} (c) $t^2 e^{t}$ (d) t

39. Inverse Laplace transform of $\frac{2}{s-b}$ is

(a) $2e^{-bt}$ (b) $2e^{bt}$ (c) $2te^{bt}$ (d) $2bt$

40. If $L^{-1}[F(s)] = f(t)$ then $L^{-1}\left(\frac{F(s)}{s}\right)$ is

(a) $\int_0^\infty f(t)dt$ (b) $\int_0^t f(t)dt$ (c) $\int_{-\infty}^\infty f(t)dt$ (d) $\int_{-a}^a f(t)dt$

41. If $L^{-1}[F(s)] = f(t)$ then $L^{-1}\left(\frac{1}{s^2+4}\right)$ is

(a) $\frac{\sin 2t}{2}$ (b) $\frac{\sin\sqrt{2}t}{\sqrt{2}}$ (c) $\sin 2t$ (d) $\sin\sqrt{2}t$

42. Inverse Laplace transform of $\frac{1}{s^2-a^2}$ is

(a) $\frac{\sin at}{a}$ (b) $\frac{\sinh at}{a}$ (c) $\sin at$ (d) $\sinh at$

43. If $L^{-1}[F(s)] = f(t)$ then $L^{-1}\left(\frac{1}{s^2}\right)$ is

(a) t (b) $2t$ (c) $3t$ (d) t^2

44. Inverse Laplace transform of $\frac{s}{s^2-9}$ is

(a) $\cos 9t$ (b) $\cos 3t$ (c) $\cosh 9t$ (d) $\cosh 3t$

45. If $L^{-1}[F(s)] = f(t)$ then $L^{-1}(F(as))$ is

(a) $\frac{f(t)}{a}$ (b) $\frac{1}{a}f\left(\frac{t}{a}\right)$ (c) $f\left(\frac{t}{a}\right)$ (d) $f(at)$

46. Inverse Laplace transform of $\frac{1}{s^3}$ is

(a) $\frac{t}{2}$ (b) t (c) $\frac{t^2}{2}$ (d) t^2

47. Inverse Laplace transform of $\frac{s+3}{(s+3)^2+9}$ is

(a) $e^{3t}\cos 3t$ (b) $e^{-3t}\cos 3t$ (c) $e^{-3t}\cosh 3t$ (d) $e^{-3t}\cos 9t$

48. Inverse Laplace transform of $\frac{b}{s+a}$ is

(a) ae^{-bt} (b) be^{-bt} (c) ae^{bt} (d) be^{at}

49. The value of $e^{-t} * \sin t =$

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

50. The value of $1 * e^t$ is

$(a)\ e^t-1$ $(b)\ e^t+1$ $(c)\ e^t$ $(d)\ e$

ANSWERS:

1	a	11	d	21	b	31	a	41	a
2	b	12	a	22	b	32	c	42	b
3	c	13	b	23	c	33	a	43	a
4	a	14	b	24	a	34	a	44	d
5	a	15	d	25	c	35	b	45	b
6	a	16	a	26	b	36	a	46	c
7	d	17	a	27	a	37	a	47	b
8	b	18	a	28	a	38	b	48	b
9	a	19	d	29	a	39	b	49	c
10	b	20	d	30	a	40	b	50	a

UNIT– IV: ANALYTIC FUNCTIONS

1. Cauchy – Riemann equation in polar co-ordinates are
   $(a)\ ru_r = v_\theta, u_\theta = -rv_r$ $(b)\ -ru_r = v_\theta, u_\theta = rv_r$
   $(c)\ -ru_r = v_\theta, u_\theta = rv_r$ $(d)\ u_r = rv_\theta, ru_\theta = v_r$

2. If $w = f(z)$ is analytic function of $z,$ then
   $(a)\ \frac{\partial w}{\partial z} = i\frac{\partial w}{\partial x}$ $(b)\ \frac{\partial w}{\partial z} = i\frac{\partial w}{\partial y}$ $(c)\ \frac{\partial^2 w}{\partial z \partial \overline{z}} = 0$ $(d)\ \frac{\partial w}{\partial \overline{z}} = 0$

3. The function $f(z) = u + iv$ is analytic if
   $(a)\ u_x = v_y, u_y = -v_x$ $(b)\ u_x = -v_y, u_y = v_x$
   $(c)\ u_x + v_y = 0, u_y - v_x = 0$ $(d)\ u_y = v_y, u_x = v_x$

4. The function $w = \sin x \cosh y + i \cos x \sinh y$ is
   (a) need not be analytic (b) analytic (c) discontinuous
   (d) differentiable only at origin

5. If u and v are harmonic, then $u + iv$ is
   (a) harmonic (b) need not be analytic (c) analytic (d) continuous

6. If a function $u(x, y)$ satisfies $u_{xx} + u_{yy} = 0,$ then u is
   (a) analytic (b) harmonic (c) differentiable (d) continuous

7. If $u + iv$ is analytic, then the curves $u = c_1$ and $v = c_2$ are
   (a) cut orthogonally (b) intersect each other (c) are parallel
   (d) coincides

8. The invariant point of the transformation $w = \frac{1}{z - 2i}$ is
   (a) $z = i$ $(b)\ z = -i$ $(c)\ z = 1$ $(d)\ z = -1$

9. The transformation $w = cz$ where c is real constant represents
   (a) rotation (b) reflection (c) magnification (d) magnification and rotation

10. The complex function $w = az$ where a is complex constant represents
    (a) rotation (b) magnification and rotation (c) translation (d) reflection

11. The values of $C_1 \& C_2$ such that the function $f(z) = C_1 xy + i[C_2 x^2 + y^2]$ is analytic are
    $(a)\ C_1 = 0, C_2 = 1$ $(b)\ C_1 = 2, C_2 = -1$
    $(c)\ C_1 = -2, C_2 = 1$ $(d)\ C_1 = -2, C_2 = 0$

12. The real part of $f(z)=e^{2z}$ is

$(a)\ e^x\cos y$ $(b)\ e^x\sin y$ $(c)\ e^{2x}\cos 2y$ $(d)\ e^{2x}\sin 2y$

13. If *f(z)* is analytic where $f(z)=r^2\cos 2\theta+ir^2\sin p\theta$, the value of p is

$(a)\ p=1$ $(b)\ p=-2$ $(c)\ p=-1$ $(d)\ p=2$

14. The points at which the function $f(z)=\dfrac{1}{z^2+1}$ fails to be analytic an

$(a)\ z=\pm 1$ $(b)\ z=\pm i$ $(c)\ z=0$ $(d)\ z=\pm 2$

15. The critical point of transformation $w=z^2$ is

$(a)\ z=2$ $(b)\ z=0$ $(c)\ z=1$ $(d)\ z=-2$

16. An analytic function with constant modulus is

(a) zero (b) analytic (c) constant (d) harmonic

17. The image of the rectangular region in the z-plane bounded by the lines $x=0,\ \ y=0,\ \ x=2$ and $y=1$ under the transformation $w=2z$.

(a) parabola (b) circle (c) straight line (d) rectangle is magnified twice

18. If $f(z)$ and $\overline{f(z)}$ are analytic function of z, then $f(z)$ is

(a) analytic (b) zero (c) constant (d) discontinuous

19. The invariant points of the transformation $w=-\left(\dfrac{2z+4i}{iz+1}\right)$ are

$(a)\ z=4i,-i$ $(b)\ z=-4i,i$ $(c)\ z=2i,i$ $(d)\ z=-2i,i$

20. The function $|z|^2$ is

(a) differentiable at the origin (b) analytic (c) constant (d) differentiable everywhere

21. If f(z) is regular function of z then,

$(a)\left(\dfrac{\partial^2}{\partial x^2}+\dfrac{\partial^2}{\partial y^2}\right)|f(z)|^2=|f'(z)|^2$ $(b)\left(\dfrac{\partial^2}{\partial x^2}+\dfrac{\partial^2}{\partial y^2}\right)|f(z)|^2=4|f'(z)|^2$

$(c)\left(\dfrac{\partial}{\partial x}+\dfrac{\partial}{\partial y}\right)|f(z)|^2=4|f'(z)|^2$ $(d)\left(\dfrac{\partial^2}{\partial x^2}+\dfrac{\partial^2}{\partial y^2}\right)|f(z)|^2=4|f'(z)|$

22. The transformation $w=z+c$ where c is a complex constant represents

(a) rotation (b) magnification (c) translation (d) magnification & rotation

23. The mapping $w=\dfrac{1}{z}$ is

(a) conformal (b) not conformal at $z=0$ (c) conformal every where
(d) orthogonal

24. The function $u+iv=\dfrac{x-iy}{x-iy+a}$ $(a\neq 0)$ is not analytic function of z where as $u-iv$ is

(a) need not be analytic (b) analytic at all points (c) analytic except at $z=a$
(d) continuous everywhere

25. If z_1, z_2, z_3, z_4 are four points in the z-plane then the cross-ratio of these point is

(a) $\dfrac{(z_1-z_2)(z_4-z_3)}{(z_1-z_4)(z_2-z_3)}$ (b) $\dfrac{(z_1-z_2)(z_3-z_4)}{(z_1-z_4)(z_3-z_2)}$

(c) $\dfrac{(z_1-z_2)(z_4-z_3)}{(z_1-z_4)(z-z_3)}$ (d) $\dfrac{(z_1-z_2)(z_3-z_4)}{(z_4-z_1)(z_3-z_2)}$

26. The invariant points of the transformation $w=\dfrac{1-iz}{z-i}$

(a) 0 (b) $\pm i$ (c) ± 2 (d) ± 1

ANSWERS:

1	a	6	b	11	b	16	c	21	b	26	d
2	d	7	a	12	c	17	d	22	c		
3	a	8	a	13	d	18	c	23	b		
4	b	9	c	14	b	19	a	24	c		
5	b	10	b	15	b	20	a	25	b		

UNIT – V: COMPLEX INTEGRATION

1. A curve which does not cross itself is called a
   (a) curve (b) closed curve (c) simple closed curve (d) multiple curve

2. The value of $\int_c \frac{zdz}{z-2}$ where c is the circle $|z|=1$ is
   (a) 0 (b) $\frac{\pi}{2}i$ (c) $\frac{\pi}{2}$ (d) 2

3. The value of $\int_c \frac{z}{(z-1)^2}dz$ where c is the circle $|z|=2$ is
   (a) πi (b) $2\pi i$ (c) $4\pi i$ (d) 0

4. The value of $\int_c (z-2)^n dz;\ (n \neq 1)$ where c is the circle $|z-2|=4$ is
   a. 2^n (b) n^2 (c) 0 (c) n

5. The value of $\int_c \frac{1}{2z+1}dz$ where c is the circle $|z|=1$ is
   (a) 0 (b) πi (c) $\frac{\pi}{2}i$ (d) 2

6. The value of $\int_c \frac{1}{3z+1}dz$ where c is the circle $|z|=1$ is
   (a) 0 (b) πi (c) $\frac{2\pi}{3}i$ (d) 2

7. If $f(z)$ is analytic inside and on c, the value of $\int_c \frac{f(z)}{z-a}dz$, where c is the simple closed curve and a is any point within c, is
   (a) $f(a)$ (b) $2\pi i f(a)$ (c) $\pi i f(a)$ (d) 0

8. If $f(z)$ is analytic inside and on c, the value of $\int_c f(z)dz$, where c is the simple closed curve, is
   (a) $f(a)$ (b) $2\pi i f(a)$ (c) $\pi i f(a)$ (d) 0

9. If $f(z)$ is analytic inside and on c, the value of $\int_c \frac{f(z)}{(z-a)^2}dz$, where c is the simple closed curve and a is any point within c, is
   (a) $f'(a)$ (b) $2\pi i f'(a)$ (c) $\pi i f'(a)$ (d) 0

10. If $f(z)$ is analytic inside and on c, the value of $\int_c \frac{f(z)}{(z-a)^3} dz$, where c is the simple closed curve and a is any point within c, is

(a) $f''(a)$ (b) $2\pi i f''(a)$ (c) $\pi i f''(a)$ (d) 0

11. Let $C: |z-a| = r$ be a circle, the f(z) can be expanded as a Taylor's series if

(a) $f(z)$ is a defined function within c

(b) $f(z)$ is a analytic function within c

(c) $f(z)$ is not a analytic function within c

(d) $f(z)$ is a analytic function outside c

12. Let $C_1: |z-a| = R_1$ and $C_2: |z-a| = R_2$ be two concentric circles ($R_2 < R_1$), the $f(z)$ can be expanded as a Laurent's series if

(a) $f(z)$ is analytic within C_2

(b) $f(z)$ is not analytic within C_2

(c) $f(z)$ is analytic in the annular region

(d) $f(z)$ is not analytic in the annular region

13. Let $C_1 : |z-a| = R_1$ and $C_2 : |z-a| = R_2$ be two concentric circles ($R_2 < R_1$), the annular region is defined as

(a) within C_1 (b) within C_2

(c) within C_2 and outside C_1 (d) within C_1 and outside C_2

14. The part $\sum_{n=0}^{\infty} a_n (z-a)^n$ consisting of positive integral powers of $(z-a)$ is called as

(a) The analytic part of the Laurent's series

(b) The principal part of the Laurent's series

(c) The real part of the Laurent's series

(d) The imaginary part of the Laurent's series

15. The part $\sum_{n=1}^{\infty} b_n (z-a)^{-n}$ consisting of negative integral powers of $(z-a)$ is called as

(a) The analytic part of the Laurent's series

(b) The principal part of the Laurent's series

(c) The real part of the Laurent's series

(d) The imaginary part of the Laurent's series

16. The annular region for the function $f(z) = \frac{1}{z(z-1)}$ is

(a) $0 < |z| < 1$ (b) $1 < |z| < 2$ (c) $1 < |z| < 0$ (d) $|z| < 1$

17. The annular region for the function $f(z)=\dfrac{1}{(z-1)(z-2)}$ is

(a) $0<|z|<1$ (b) $1<|z|<2$ (c) $1<|z|<0$ (d) $|z|<1$

18. The annular region for the function $f(z)=\dfrac{1}{z^2-z-6}$ is

(a) $0<|z|<1$ (b) $1<|z|<2$ (c) $2<|z|<3$ (d) $|z|<3$

19. If $f(z)$ is not analytic at $z=z_0$ and there exists a neighborhood of $z=z_0$ containing no other singularity, then

(a) The point $z=z_0$ is isolated singularity of $f(z)$

(b) The point $z=z_0$ is a zero point of $f(z)$

(c) The point $z=z_0$ is nonzero of $f(z)$

(d) The point $z=z_0$ is non isolated singularity of $f(z)$

20. If $f(z)=\dfrac{\sin z}{z}$, then

(a) $z=0$ is a simple pole (b) $z=0$ is a pole of order 2

(c) $z=0$ is a removable singularity (d) $z=0$ is a zero of $f(z)$

21. If $f(z)=\dfrac{\sin z-z}{z^3}$, then

(a) $z=0$ is a simple pole (b) $z=0$ is a pole of order 2

(c) $z=0$ is a removable singularity (d) $z=0$ is a zero of $f(z)$

22. If $\lim_{z\to a}(z-a)^n f(z)\neq 0$ then

(a) $z=a$ is a simple pole (b) $z=a$ is a pole of order n

(c) $z=a$ is a removable singularity (d) $z=a$ is a zero of $f(z)$

23. If $f(z)=\dfrac{1}{(z-4)^2(z-3)^3(z-1)}$, then

(a) 4 is a simple pole, 3 is a pole of order 3 and 1 is a pole of order 2

(b) 3 is a simple pole, 1 is a pole of order 3 and 4 is a pole of order 2

(c) 1 is a simple pole, 3 is a pole of order 3 and 4 is a pole of order 2

(d) 3 is a simple pole, 4 is a pole of order 1 and 4 is a pole of order 2

24. If $f(z)=e^{\frac{1}{z-4}}$ then

(a) $z=4$ is removable singularity (b) $z=4$ is pole of order 2

(c) $z=4$ is an essential singularity (d) $z=4$ is zero of $f(z)$

25. Let $z = a$ is a simple pole for $f(z)$ and $b = \lim_{z \to a}(z-a)f(z)$, then

(a) b is a simple pole (b) b is a residue at a
(c) b is removable singularity (d) b is a residue at a of order n

26. The residue of $f(z) = \dfrac{1-e^{2z}}{z^3}$ is

(a) 0 (b) 2 (c) -2 (d) 1

27. The residue of $f(z) = \dfrac{e^{2z}}{(z+1)^2}$ is

(a) e^{-2} (b) -2 e^{-2} (c) -1 (d) 2 e^{-2}

28. The residue of $f(z) = \cot z$ is

(a) π (b) 1 (c) -1 (d) 0

ANSWERS:

1	c	6	c	11	b	16	a	21	c	26	c
2	a	7	b	12	c	17	b	22	b	27	d
3	b	8	d	13	d	18	c	23	c	28	b
4	c	9	b	14	a	19	a	24	c		
5	b	10	b	15	b	20	c	25	b		