R. T. M. Nagpur University

SUBJECT: Mathematics - II

B. E. 2nd Semester

Multiple Choice Questions

Module - 1 - Integral Calculus - I

(1)

The value of $\Gamma\frac{7}{2}$ is

(A) $\frac{\sqrt{\pi}}{2}$ (B) $\frac{15\sqrt{\pi}}{8}$

(C) $\frac{3\sqrt{\pi}}{4}$ (D) $\frac{5\sqrt{\pi}}{2}$

Ans : B

(2)

The value of $\Gamma n\,\Gamma 1-n$ is

(A) $\frac{1}{sinn\pi}$ (B) $\frac{\pi}{cosn\pi}$

(C) $\frac{\pi}{sinn\pi}$ (D) $\frac{1}{cosn\pi}$

Ans : C

(3)

Γ(n+1) = n! can be used when

(A) n is any integer

(B) n is a positive integer

(C) n is a negative integer

(D) n is any real number

Ans : B

(4)

What is the value of $\Gamma\left(\frac{1}{2}\right)$?

(A)$\sqrt{\pi}$ (B) $\left(\frac{\sqrt{\pi}}{\sqrt{2}}\right)$

(C) $\left(\frac{\sqrt{\pi}}{2}\right)$ (D) $\frac{\pi}{2}$

Ans : A

(5)

What is the value of $\Gamma\left(\frac{9}{4}\right)$?

(A) $5/4 * 1/4 * \Gamma(1/4)$

(B) $9/4 * 5/4 * 1/4 * \Gamma(1/4)$

(C) $5/4 * 1/4 * \Gamma(5/4)$

(D) $1/4 * \Gamma(1/4)$

Ans : A

(6)

The value of $\int_0^\infty e^{-z} z^{1/2} dz$ is

(A) $\sqrt{\pi}$ (B) $\sqrt{\pi}/2$

(C) $\sqrt{\pi}/3$ (D) $\sqrt{\pi}/4$

Ans: B

(7)

The value of $\sqrt{\left(\frac{1}{2}+x\right)}\sqrt{\left(\frac{1}{2}-x\right)}$ is

(A) $\pi/\sin\pi x$ (B) $\pi/\cos\pi x$

(C) $\sqrt{\pi}/\sin\pi x$ (D) $\sqrt{\pi}/\cos\pi x$

Ans: B

(8)

The value of $\int_0^\infty e^{-x} x^{-1/4}\,dx \times \int_0^\infty e^{-x} x^{-3/4}\,dx$ is

(A) π (B) 2π

(C) $\sqrt{2}\,\pi$ (D) $\sqrt{3}\,\pi$

Ans: C

(9)

The value of $\int_0^\infty 2e^{-z} z^{3/2}\,dz$ is

(A) $\frac{3}{2}\sqrt{\pi}$ (B) $\sqrt{\pi}$

(C) $2\sqrt{\pi}$ (D) $3\sqrt{\pi}$

Ans: A

(10)

Which of the following is true?

(A) $\beta(m,n) = \int_0^1 x^{m-1}(1-x)^{n-1}\,dx$ (B) $\beta(m,n) = \int_0^\infty [x^{m-1}/(1+x)^{m+n}]dx$

(C) $\beta(m,n) = \int_0^\infty [x^{n-1}/(1+x)^{m+n}]dx$ (D) All of the above

Ans: D

(11)

If $\beta(n,3) = 1/3$ and n is a positive integer, then the value of n is

(A) 4 (B) 3

(C) 2 (D) 1

Ans: D

(12)

$\beta(m,n) = ?$

(A) $\beta(m-1,n)$ (B) $\beta(m-1,n-1)$

(C) $\beta(m,n+1)+\beta(m+1,n)$ (D) $\beta(m,n-1)+\beta(m-1,n)$

Ans: C

(13)

$\beta(m,n) = ?$

(A) $\frac{m}{m+n}\beta(m,n)$ (B) $m\beta(m,n)$

(C) $(m+n)\beta(m,n)$ (D) $(m-n)\beta(m,n)$

Ans: A

(14)

The value of $\int_0^1 t^2(1-t)^{-1/2}\,dt$ is

(A) 16/15 (B) 13/11

(C) 17/32 (D) 19/32

Ans: A

(15)

The value of $\int_0^1 t^{-1/2}(1-t)^{-1/2}\,dt$ is

(A) π (B) 2π

(C) $\pi/2$ (D) $\pi/\sqrt{2}$

Ans: A

(16)

The value of $\int_0^1 x^{3/2}(1-x)^{1/2}\,dx$ is

(A) $\pi/2$ (B) $\pi/16$

(C) $\pi/20$ (D) $\pi/\sqrt{2}$

Ans: B

(17)

What is the value of $\int_0^{\pi/2} \sqrt{\sin\theta\, d\theta} + \int_0^{\pi/2} \sqrt{\cos\theta\, d\theta}$?

(A) $8\sqrt{\pi}\frac{\Gamma\left(\frac{3}{4}\right)}{\Gamma\left(\frac{1}{4}\right)}$ (B) $4\sqrt{\pi}\frac{\Gamma\left(\frac{3}{4}\right)}{\Gamma\left(\frac{1}{4}\right)}$

(C) $8\sqrt{\pi}\frac{\Gamma\left(\frac{1}{4}\right)}{\Gamma\left(\frac{3}{4}\right)}$ (D) $4\sqrt{\pi}\frac{\Gamma\left(\frac{1}{4}\right)}{\Gamma\left(\frac{3}{4}\right)}$

Ans : A

(18)

The value of $\beta(m+1,n)$ is

(A)$\frac{1}{m+n}\beta(m,n)$ (B) $\frac{m}{m+n}\beta(m,n)$

(C) $\frac{n}{m+n}\beta(m,n)$ (D) $\frac{\lceil m \lceil n}{\lceil m+n}$

Ans: B

(19)

Which of the following function is not called the Euler's integral of the first kind?

(A) $\beta(m,n) = \int_0^1 x^{m-1}(1-x)^{n-1}dx\ (m>0, n>0)$

(B) $\beta(m,n) = \int_0^{\pi/2}(\sin\theta)^{2m-1}(\cos\theta)^{2n-1}\, d\theta$

(C) $\beta(m,n) = \int_0^{\infty}\frac{y^{n+1}}{(1+y)^{m+n}}dy$

(D) $\beta(m,n) = 2\int_0^{\pi/2}(\sin\theta)^{2m-1}(\cos\theta)^{2n-1}\, d\theta$

Ans: B

(20)

Which of the following is not the definition of Beta function?

(A) $\beta(m,n) = 2\int_0^1 x^{m-1}(1-x)^{n-1}dx\ (m>0, n>0)$

(B) $\beta(m,n) = 2\int_0^{\pi/2}(\sin\theta)^{2m-1}(\cos\theta)^{2n-1}\, d\theta$

(C) $\beta(m,n) = \int_0^{\infty}\frac{y^{n+1}}{(1+y)^{m+n}}dy$

(D) $\beta(m,n) = \int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}dx$

Ans: A

(21)

What is the value of $\beta\left(\frac{1}{2},\frac{1}{2}\right)$?

(A) $\pi/2$ (B) π

(C) $\pi/4$ (D) $\pi/\sqrt{2}$

Ans: B

(22)

What is the value of $\beta(3,2)$?

(A) 1/4 (B) 1/6 (C) 1/12 (D) 1/16

Ans: C

(23)

The value of $\int_0^1 \frac{4x^3}{\sqrt{1-x}}dx$ is

(A) 11/35 (B) 128/35 (C) 12/25 (D) 21/25

Ans: B

(24)

What is the value of $\beta\left(\frac{1}{4},\frac{3}{4}\right)$?

(A) π (B) $\sqrt{2}\pi$ (C) $\sqrt{2\pi}$ (D) 2π

Ans: B

(25)

What is the value of $\beta\left(\frac{9}{2},3\right)$?

(A) $16/1287$ (B) $16/127$ (C) $14/1287$ (D) $14/127$

Ans: A

(26)

What is the value of $\int_0^1 x^5\,(1-x)^6 dx$

(A) $1/42$

(B) $1/496$

(C) $1/5544$

(D) $1/9842$

Ans: C

(27)

The value of $\int_0^{\pi/2} \sqrt{tan\theta}\, d\theta$ is

(A) $\frac{\pi}{\sqrt{4}}$ (B) $\frac{\pi}{\sqrt{2}}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

Ans : B

(28)

Lebnitz's first rule is applied when limits of integration are _____ of parameter

(A) Dependent (B) Power

(C) Independent (D) Product

Ans : C

(29)

If $F(a) = \int_0^1 \frac{x^a - 1}{\log x} dx$, then $F'(a)$ is

(A) $\frac{-1}{1+a^2}$ (B) $\frac{1}{1+a^2}$

(C) $\frac{-1}{a+1}$ (D) $\frac{1}{a+1}$

Ans : D

(30)

If $f(x,\alpha)$ and $\frac{\partial}{\partial\alpha}f(x,\alpha)$ are continuous functions of *x* and α, then

$\frac{d}{d\alpha}\int_a^b f(x,\alpha)dx$ is

(A) $\int_a^b f(x,\alpha)dx$

(B) $\int_a^b f''(x,\alpha)dx$

(C) $\int_a^b \frac{\partial}{\partial\alpha}f(x,\alpha)dx$

(D) None of these

Ans: C

(31)

If $f(x,\alpha)$ and $\frac{\partial}{\partial\alpha}f(x,\alpha)$ are continuous functions of *x* and α, then

$\frac{d}{d\alpha}\int_{\phi(\alpha)}^{\psi(\alpha)} f(x,\alpha)dx$ is

(A) $\int_{\phi(\alpha)}^{\psi(\alpha)} \frac{\partial}{\partial\alpha}f(x,\alpha)dx + \frac{d\psi}{d\alpha}f[\psi(\alpha),\alpha] - \frac{d\phi}{d\alpha}f[\phi(\alpha),\alpha]$

(B) $\int_{\phi(\alpha)}^{\psi(\alpha)} \frac{\partial}{\partial\alpha}f(x,\alpha)dx$

(C) $\int_{\phi(\alpha)}^{\psi(\alpha)} f''(x,\alpha)dx$

(D) None of these

Ans: A

(32)

If $F(b)=\int_0^1 \frac{x^b}{\log x}dx$, $b>0$, then the value of $\frac{d}{da}F(b)$ is

(A) $\frac{1}{1+b}$ (B) $\frac{b}{1+b}$ (C) $\frac{1}{1-b}$ (D) $\frac{b}{1-b}$

Ans: A

(33)

The root mean square value of $f(x)=x(1-x)\quad 0\le x\le 1$is

(A) 3.7131 (B) 5.2225 (C) 0.1825 (D) 1.1325

Ans: C

(34)

If a rod of length 'a' is divided into two parts at random. Then the mean value of the sum of the squares on these two segments is

(A) $2a^2/3$ (B) $3a^2/2$ (C) $2a^3/3$ (D) $3a^3/2$

Ans: A

(35)

The root mean square value of $f(x)$ over the range $(a,b)$is is given by

(A) $\frac{\int_a^b f(x)dx}{b-a}$ (B) $\frac{\sqrt{\int_a^b f(x)dx}}{b-a}$

(C) $\sqrt{\frac{\int_a^b [f(x)]^2 dx}{b-a}}$ (D) $\frac{\int_a^b [f(x)]^2 dx}{b-a}$

Ans : C

(36)

The mean value of $f(x)$ over the range (a,b) is given by

(A) $\dfrac{\int_a^b f(x)dx}{b-a}$

(B) $\dfrac{\sqrt{\int_a^b f(x)dx}}{b-a}$

(C) $\sqrt{\dfrac{\int_a^b f(x)dx}{b-a}}$

(D) $\dfrac{\int_a^b [f(x)]^2 dx}{b-a}$

Ans: A

(37)

The mean square value of $f(x)$ over the range (a,b) is given by

(A) $\dfrac{\int_a^b f(x)dx}{b-a}$

(B) $\dfrac{\sqrt{\int_a^b f(x)dx}}{b-a}$

(C) $\sqrt{\dfrac{\int_a^b [f(x)]^2 dx}{b-a}}$

(D) $\dfrac{\int_a^b [f(x)]^2 dx}{b-a}$

Ans: D

(38)

The root mean square root value of $y = e^x + 1$ over the range (0,2).

(A) 1.2241 (B) 2.2317 (C) 3.6108 (D) 4.5595

Ans: D

(39)

The root mean square value of $y = \sqrt{\log_e x}$ over the range (1, e) is

(A) $\frac{1}{e-1}$ (B) $\frac{1}{\sqrt{e-1}}$ (C) 1 (D) Does not exist

Ans: B

(40)

The mean value of y = A sin pt over the range $(0, \frac{\pi}{p})$ is

(A) 0.637 A (B) 0.481 A (C) 0.332 A (D) Does not exist

Ans: A

1. The curve $x^3-y^3 =3axy$ is symmetric bout

   A) X-axis B) Y-axis C) both the axes D) about the line y= - x

   Ans.:D

2. The curve $x^3-y^3 =3xy$ is symmetric bout

   A) X-axis B) Y-axis C) both the axes D) about the line y= - x

   Ans.:D

3. The curve $y^2(2a-x)= x^3$ has asymptote parallel to y-axis at

   A) x=2a B) y=2a C) x = 0 D) y = 0

   Ans.:A

4. The curve $y^2(2-x)= x^3$ has asymptote parallel to y-axis at

   A) x=2 B) y=2a C) x = 0 D) y = 0

   Ans.:A

5. Equation to the tangent at origin for the curve $3y^2=x(x-1)^2$ is

   A) X = a B) y = a C) x = 0 D) y = 0

   Ans.:C

6. The Cartesian form of the parametric curve x= a $\cos^3\theta$, y= a $\sin^3\theta$ is

   A) $x^2+y^2=a^2$ B) $x^3+y^3=a^3$ C) $x^{2/3}+y^{2/3}=a^{2/3}$ D) $x^{3/2}+y^{3/2} = a^{3/2}$

   Ans.:C

7. The Cartesian form of the parametric curve x= $\cos^3\theta$, y= $\sin^3\theta$ is

   A) $x^2+y^2=1$ B) $x^3+y^3=1$ C) $x^{2/3}+y^{2/3}=1$ D) $x^{3/2}+y^{3/2} = 1$

   Ans.:C

Edit with WPS Office

8. The curve r = a(1+ cosθ) lie within a circle of radius

A) a B) 2a C) 1 D) 2

Ans.:B

9. The equation r= 2a cosθ represents a circle whose centre and radius are:

A) (2a,0) and a B) (a,0) and a C) (2a,0) and 2a D) (a,0) and 2a

Ans.:B

10. The equation r= 2 sinθ represents a circle whose centre and radius are:

A) (2a,0) and a B) (0,1) and 1 C) (2a,0) and 2a D) (1,0) and 1

Ans.:B

11.

The area included between the curves $y= x^2$ and the straight line $y=3x+4$ is:

A) 121/6 B) 125/6 C) 123/6 D) 131/6

Ans. B

12.

The whole length of the curve $\mathbf{x^{2/3}+y^{2/3}=1}$ is:

A) 6 units B) 8 units C) 16 units D) 18 units

Edit with WPS Office

Ans. A

13. The area outside the circle r = 2acosθ and inside the cardioid r = a(1+ cosθ) is:

A) πa^2 B) $3a^2/2$ C) $\pi a^2/2$ D) $3\pi a^2/2$

Ans.: C

14. The area enclosed by the parabolas $y^2=4ax$ and $x^2=4ay$ is:

A) $(16/3)a^2$ B) $(32/3)a^2$ C) $(31/3)a^2$ D) $(23/3)a^2$

Ans.:A

15. The area of one of the loops of the curve $y^2= x^2 - x^4$ is

A) 1/3 B) 2/3 C) 1/6 D) ½

Ans.: B

16. The area of the curve $x^{2/3}+y^{2/3}=a^{2/3}$ is:

A) $3\pi a^2/8$ B) $\pi a^2/8$ C) $3\pi/8$ D) $3a^2/8$

Ans.:A

17. The area of the cardioid r = a(1- cosθ) is:

A) πa^2 B) $3a^2/2$ C) $8a^2/2$ D) $3\pi a^2/2$

Ans.:D

Edit with WPS Office

18.

The area outside the circle r = 2 cosθ and inside the cardioid r = (1+ cosθ) is:

A) π B) 3/2 C) π/2 D) 3π /2

Ans.: C

19.

The curve r = (1+ cosθ) is symmetric about:

A) pole B) Initial line C) both A and B D) None of the above

Ans.: B

20.

Length of the arc of the curve y=f(x) between the points whose abscissas a and b is

A) $s=\int_a^b \sqrt{\left\{1+\left(\frac{dy}{dx}\right)^2\right\}}dx$ B) $s=\int_a^b \sqrt{\left\{1+\left(\frac{dy}{dx}\right)\right\}}dx$

C) $s=\int_a^b \sqrt{\left\{1+\left(\frac{dx}{dy}\right)^2\right\}}dx$ D) $s=\int_a^b \sqrt{\left\{1-\left(\frac{dy}{dx}\right)\right\}}dx$

Ans.: A

21

The area enclosed by the curve x=f(y), the Y-axis and the abscissa y=c and y=d is given by

A) $\int_c^d y\,dy$ B) $\int_c^d x\,dy$ C) $\int_c^d x^2\,dy$ D) $\int_c^d y^2\,dy$

Ans. B

Edit with WPS Office

22

The area enclosed by the curve y=f(x), the X-axis and the ordinates x=a and x=b is given by

A) $\int_a^b y\,dx$ B) $\int_a^b x\,dy$ C) $\int_a^b x^2\,dy$ D) $\int_a^b y^2\,dy$

Ans.:A

23

Volume of the solid generated by revolving of the area bounded by the curve y=f(x) about the X-axis is given by

A) $V = \pi \int_a^b y\,dx$ B) $V = \pi \int_a^b x\,dy$ C) $V = \pi \int_a^b x^2\,dy$ D) $V = \pi \int_a^b y^2\,dx$

Ans. D

24

Volume of the solid generated by revolving of the area bounded by the curve y=f(x) about the line parallel to the X-axis is given by

A) $V = \pi \int_a^b (y - k)\,dx$ B) $V = \pi \int_a^b (x - k)\,dy$

C) $V = \pi \int_a^b x^2\,dy$ D) $V = \pi \int_a^b (y - k)^2\,dx$

Ans. D

25

Area bounded by the curve r=f(Θ) and the radii vectors $\Theta = \Theta_1$ and $\Theta = \Theta_2$ is

Edit with WPS Office

A) $\frac{1}{2}\int_{\theta_1}^{\theta_2} r \, d\theta$ B) $\frac{1}{2}\int_{\theta_1}^{\theta_2} r^2 \, d\theta$ C) $\int_{\theta_1}^{\theta_2} r^2 \, d\theta$ D) $\int_{\theta_1}^{\theta_2} r \, d\theta$

Ans. :B

26.

The area of the loop of the curve $y^2=x^2(a-x)$ is

A) $a^2/3$ B) $2\,a^2/3$ C) $4\,a^2/3$ D) $8\,a^2/15$

Ans. : D

27.

The area between the parabola $y= 4x-x^2$ and the line y=x is:

A) 9/2 B) 7/2 C) 5/2 D) 3/2

Ans. A

28.

The area enclosed by the two parabolas $y^2=4x$ and $y^2=-4(x-2)$ is:

A) 16/5 B) 16/3 C) 9/3 D) 9/4

Ans. B

Ans D

29`

If at the origin there are two tangents, which are real and different then the origin is called

A) Cusp B) conjugate point C) Node D) None of these

Ans.: C

30.

Edit with WPS Office

The curve $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is symmetric about

A)Both the axes B) about the line y=x C) in opposite quadrant D) all of the above

Ans.: D

31.

Which of the following characteristic is not included in the study of general procedure for tracing the algebraic curve?
A) Symmetry
B) Region or Extent
C) Orthogonality
D) Tangents to the Curve at the origin

Ans.:C

32.

Which of the following is not an example for curve symmetric about y axis?
a) $x^2=4ay$
b) $x^2=ay$
c) $y^2=4ax$
d) $x^2=2ay$

Ans.:C

33

Which of the following graphs represent symmetric about the origin?
A) $y^2=4ax$
B) $x^5+y^5=5a^2x^2y$
C) $x^2=4ay$
D) $x^2+y^2=a^2$

Ans.: D

Edit with WPS Office

34.

What is meant by quadrature process in mathematics?
A) Finding area of plane curves
B) finding volume of plane curves
C) Finding length of plane curves
D) finding slope of plane curves

Ans. C

35.

What is the volume generated when the region surrounded by $y = \sqrt{x}$, $y = 2$ and $y = 0$ is revolved about y – axis?
a) 32/π cubic units
b) 32/5 cubic units
c) 32π/5 cubic units
d) 5π/32 cubic units

Ans. C

36.

The area of the curve $x^{2/3}+y^{2/3}=1$ is:

A) $3\pi a^2/2$ B) $3\pi/8$ C) $4\pi/5$ D) $4\pi a^2/5$

Ans B

37.

The length of the cardioid $r = (1+\cos\theta)$ is:

A) 4 B) 3 C) 8 D) 3/2

Ans.: C

38.

The area between the curves $r = 2\cos\theta$ and $r = 4\cos\theta$ is

Edit with WPS Office

A) 3π B) 4π C) π D) 3π /2

Ans.: A

39.

The area between the curves r =2 (1+cosθ) and r = (1+cosθ) is

A) 3π B) 4π C) 9π/2 D) 3π /2

Ans. C

40.

The area enclosed by the parabolas y=2$\sqrt{x}$ and x =$_2\sqrt{y}$ is:

A) 16/3 B) 32/3 C) 6π D) 23/3

Ans.:A

Edit with WPS Office

M-II

Module -III Multivariable Calculus (Integration)

Question Bank

Q 1) Using double integration, the area of the region bounded by parabolas $y = x^2$ and $x = y^2$ is

a) 3 b) 1

c) 1/3 d) 0

Ans: c

Q 2) If area A of the region bounded by curve $r = f_1(\theta)$, $r = f_2(\theta)$ and $\theta = a$, $\theta = b$ then which of the following is true?

a) $Area = \int_a^b \int_{f_1(\theta)}^{f_2(\theta)} r\, dr d\theta$ b) $Area = \int_{f_1(\theta)}^{f_2(\theta)} \int_a^b r\, dr d\theta$

c) $Area = \int_b^a \int_{f_1(\theta)}^{f_2(\theta)} dr d\theta$ d) None of these

Ans: a

Q 3) To find the area outside the circle $r = a\cos\theta$ and inside the circle $r = 2a\cos\theta$, the limits of θ will vary from

a) $a\cos\theta \;\; to \;\; 2a\cos\theta$ b) $0 \;\; to \;\; a\cos\theta$

c) $0 \;\; to\, \pi$ d) $0 \;\; to \;\; \frac{\pi}{2}$

Ans: d

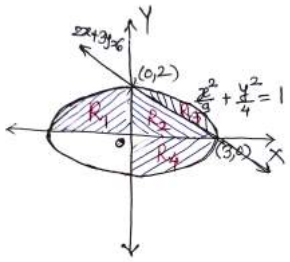
Q 4) For finding area of plate in form of quadrant of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$then which of the following is correct?

a) $Area = \int_0^a \int_0^{\frac{b}{a}\sqrt{a^2-x^2}} dydx$ b) $Area = 2\int_0^a \int_0^{\frac{b}{a}\sqrt{a^2-x^2}} dydx$

c) $Area = 4\int_0^a \int_0^{\frac{b}{a}\sqrt{a^2-x^2}} dydx$ d) None of these

Ans: c

Q 5) To find area lying between parabola $\frac{x^2}{9}+\frac{y^2}{4}=1$ and the straight line 2x+3y = 6, the required region is



a) R_1 b) R_2

c) R_3 d) R_4

Ans: c

Q 6) To find area bounded by ellipse $y = 4x - x^2$ and the line y=x,

the strip for the limits is

a) Parallel to X-axis b) Parallel to Y-axis

c) Radial d) Any of the above

Ans: b

Q 7) To find the area outside the circle $r = a\cos\theta$ and inside the circle $r = 2a\cos\theta$, the strip for the limits is

a) only vertical strip b) only horizontal strip

c) Radial strip d) both vertical strip and horizontal strip

Ans: c

Q 8) To find the volume of the region bounded by parabolas $y = x^2$, $x = y^2$ and z = 0 and z = 3 then which of the following is true?

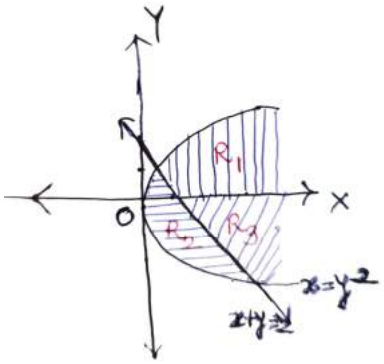
a) $Volume = \int_0^1 \int_{x^2}^{\sqrt{x}} dydx$ b) $Volume = \int_a^1 \int_{x^2}^{\sqrt{x}} dydx$

c) $Volume = \int_0^1 \int_{x^2}^{\sqrt{x}} 3\, dydx$ d) None of these

Ans: c

Q 9) To find Center of Gravity of area parabola $x = y^2$ and the line

x + y = 2, the required region is



a) R_1 b) R_2

c) R_3 d) $R_1 + R_2$

Ans: b

Q 10) By changing the order of integration, $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$ the limits of integration becomes

a) x : 0 to a
y : 0 to ∞

b) x : y to ∞
y : 0 to x

c) x : 0 to y
y : 0 to ∞

d) x : 0 to ∞
y : 0 to y

Ans : c

Q 11) $\int_0^a \int_0^x \frac{x}{x^2+y^2} dydx =$

a) $\frac{\pi}{4}$ b) $\frac{\pi}{4}a$

c) $\frac{\pi}{2}$ d) $\frac{\pi}{2}a$

Ans: b

Q 12) For evaluation of $\iint_A (x^2 + 3y^2)\, dxdy$

where A is te area of the rectangle $0 \le x \le 3;\ 0 \le y \le 1$

a) First with respect to y then with respect to x

b) First with respect to x then with respect to y

c) Does not matter

d) None of these

Ans: c

Q 13) $\int_0^1 \int_0^3 dxdy =$

a) 1 b) 3

c) 1/3 d) Not define

Ans: b

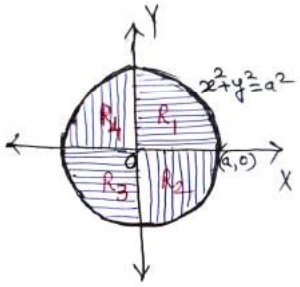
Q 14) The integral $\int_0^1 \int_{x^2}^{2-x} xy\, dxdy$ is solved by using change of order of integration. The strip for new limits is

a) Vertical strip b) Horizontal strip

c) Radial d) Any of the above

Ans: b

Q 15) For $\iint_R xydxdy$, where R is region bounded by the circle $x^2 + y^2 = a^2,\ x \geq 0, y \geq 0$ then the required region is



a) R_1 b) R_2

c) R_3 d) R_4

Ans: a

Q 16) Using double integration, to find Center of Gravity of area of the circle $x^2 + y^2 = a^2$ lying in the first quadrant and assumed density is K, which of the following is correct?

a) $\bar{x} = K\frac{\int_0^a \int_0^{\sqrt{a^2-x^2}} x\, dxdy}{\int_0^a \int_0^{\sqrt{a^2-x^2}} dxdy}, \bar{y} = K\frac{\int_0^a \int_0^{\sqrt{a^2-x^2}} y\, dxdy}{\int_0^a \int_0^{\sqrt{a^2-x^2}} dxdy}$

b) $\bar{x} = \frac{1}{K}\frac{\int_0^a \int_0^{\sqrt{a^2-x^2}} x\, dxdy}{\int_0^a \int_0^{\sqrt{a^2-x^2}} dxdy}, \bar{y} = \frac{1}{K}\frac{\int_0^a \int_0^{\sqrt{a^2-x^2}} y\, dxdy}{\int_0^a \int_0^{\sqrt{a^2-x^2}} dxdy}$

c) $\bar{x} = \frac{\int_0^a \int_0^{\sqrt{a^2-x^2}} x\, dxdy}{\int_0^a \int_0^{\sqrt{a^2-x^2}} dxdy}, \bar{y} = \frac{\int_0^a \int_0^{\sqrt{a^2-x^2}} y\, dxdy}{\int_0^a \int_0^{\sqrt{a^2-x^2}} dxdy}$

d) $\bar{x} = \frac{\int_0^{\sqrt{a^2-x^2}} \int_0^a y\, dxdy}{\int_0^{\sqrt{a^2-x^2}} \int_0^a dxdy}, \bar{y} = \frac{\int_0^{\sqrt{a^2-x^2}} x\, dxdy}{\int_0^{\sqrt{a^2-x^2}} \int_0^a dxdy}$

Ans : c

Q 17) After changing into polar coordinates, the integral $\int_0^a \int_{a-\sqrt{a^2-y^2}}^{a+\sqrt{a^2-y^2}} xydydx$ changes to

a) $\int_0^{\frac{\pi}{2}} \int_a^{2a\cos\theta} r^3 sin\theta \quad \theta\, dxdy$

b) $\int_0^{\frac{\pi}{2}} \int_a^{2a\cos\theta} r^3 drd\theta$

c) $\int_0^{\frac{\pi}{2}} \int_a^{2a\cos\theta} r^3 \sin\theta\, cos\theta\; drd\theta$

d) $\int_0^{\frac{\pi}{2}} \int_a^{a\cos\theta} r^3 \sin\theta\, cos\theta\; drd\theta$

Ans: c

Q 18) After changing into polar coordinates, the integral $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dxdy$ changes to

a) $\int_0^{\frac{\pi}{2}} \int_0^{\infty} e^{-r^2} drd\theta$

b) $\int_0^{\frac{\pi}{2}} \int_0^{\infty} e^{-r^2} rdrd\theta$

c) $\int_0^{\frac{\pi}{4}} \int_0^{\infty} e^{-r^2} rdrd\theta$

d) $\int_0^{\frac{\pi}{4}} \int_0^{\infty} e^{r^2} drd\theta$

Ans: b

Q 19) If $\rho = f(r,\theta)$ at a point (r,θ) then Mass is

a) $\iint_R r\, drd\theta$

b) $\iint_R \rho\, r\, drd\theta$

c) $\iint_R \rho\, drd\theta$

d) None of these

Ans: b

Q 20) After changing into polar coordinates, the integral $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dxdy$ then the limits of r

a) $0\ to\ \infty$

b) $0\ to\ r$

c) $0\ to\ \pi$

d) None of these

Ans: a

Q 21) $\int_0^{\pi} \int_0^{asin\theta} r\, dr d\theta =$

a) $\frac{\pi}{4}a$ b) $\frac{\pi}{4}a$

c) $\frac{\pi}{2}a^2$ d) $\frac{\pi}{4}a^2$

Ans: d

Q 22) Applications of double integral for finding

a) Mass b) Area

c) Center of gravity d) all are correct

Ans: d

Q 23) After changing into polar coordinates, the integral $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dxdy$ then the limits of θ

a) $0\ to\ \frac{\pi}{4}$ b) $0\ to \frac{\pi}{2}$

c) $0\ to\ \pi$ d) None of these

Ans: b

Q 24) For the integral, $\int_0^a \int_{a-\sqrt{a^2-y^2}}^{a+\sqrt{a^2-y^2}} a \frac{x^2}{x^2+y^2} dxdy$ what is the order of integration after changing into polar coordinates?

a) integrate with respect to y first and then x.

b) integrate with respect to x first and then y

c) integrate with respect to r first and then θ.

d) integrate with respect to θ first and then r.

Ans: c

Q 25) The integral $\int_0^2 \int_0^{\sqrt{2x-x^2}} (x^2+y^2)\, dxdy$ is solved by changing into polar coordinates. The strip for new limits is

a) Vertical strip b) Horizontal strip

c) Radial d) Any of the above

Ans: c

Q 26) For evaluation of $\int_0^1 \int_0^2 \int_0^3 (x) dx dy dz$

a) First with respect to y, secondly with respect to z then with respect to x

b) First with respect to x secondly with respect to y then with respect to z

c) First with respect to z secondly with respect to y then with respect to x

d) Does not matter

Ans: d

Q 27) For the integral, $\int_0^{\frac{\pi}{2}} \int_0^{a \sin\theta} \int_0^{\left(\frac{a^2-r^2}{a}\right)} (r) dr d\theta dz$ what is the order of integration?

a) integrate with respect to θ first then z and then r.

b) integrate with respect to θ first then r and then z.

c) integrate with respect to z first then r and then θ.

d) integrate with respect to r first then z and then θ.

Ans: c

Q 28) For the integral, $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x + y + z) dx dy dz$ what is the order of integration?

a) integrate with respect to z first then y and then x.

b) integrate with respect to x first then y and then z.

c) integrate with respect to y first then z and then x.

d) integrate with respect to y first then x and then z.

Ans: d

Q 29) For the integral, $\int_0^1 \int_y^1 \int_0^{1-x} (x+y+z)\ dz dx dy$ which of the following is true?

a) x: x = y to x = 1, y: y = 0 to y = 1, z: z = 0 to z = 1-x

b) x: x = 0 to x = 1, y: y = y to y = 1, z: z = 0 to z = 1-x

c) x: x = 0 to x = 1-x , y: y = y to y=1, z: z = 0 to z = 1

d) x: x = y to x = 1, y: y = 0 to y = 1-x, z: z = y to z = 1

Ans: a

Q 30) For $\iint_R y\,dxdy$, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$ .Which of the following is true?

a) New limits can be y: y = 0 to y = 4 and $x : x = \frac{y^2}{4}$ to $x = 2\sqrt{y}$

b) New limits can be x: x = 0 to x =4 and $y : y = 2\sqrt{x}$ to $y = \frac{x^2}{4}$

c) $\iint_R y\,dxdy = \frac{48}{5}$

d) all are correct

Ans: d

Q 31) Evaluate $\iint e^{2x+3y}\,dx\,dy$, over the triangle bounded by x = 0, y = 0

and x + y = 3

a) New limits are y: y = 0 to y = 3-x and $x : x = 0$ to x=3

b) New limits are x: x=0 to x=3 and $y : y = 3 - x$ to $y = 0$

c) New limits are x: x=0 to x=3 and y: y=0 to y=3

d) all options are correct.

Ans: a

Q 32) By changing the order of integration $\int_0^a \int_y^a \frac{x}{x^2+y^2} dxdy$,

the limits of integration becomes

a) x: y to a
   y: 0 to a

b) x: y to a
   y: 0 to x

c) x: 0 to a
   y: 0 to a

d) x: 0 to a
   y: 0 to x

Ans: d

Q 33) Using the change of order of integration, the order of evaluation of $\int_1^2 \int_0^x (x + 2y)dxdy$ is

a) First with respect to y then with respect to x

b) First with respect to x then with respect to y

c) Does not matter

d) None of these

Ans : a

Q 34) The integral $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dxdy$ is solved by using change of order of integration. The strip for new limits is

a) Parallel to X-axis b) Parallel to Y-axis

c) Radial d) Any of the above

Ans: a

Q 35) The integral $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dxdy$ is changed into polar form, then the value of integral is

a) $\pi/2$ b) $\pi/3$

c) 2π d) $\pi/4$

Ans: d

Q 36) After changing into polar coordinates the integral $\int_0^a \int_y^a \frac{x^2}{x^2+y^2}\, dx\ dy$ changes to

a) $\int_0^a \int_y^a r\cos^2\theta\ dx\ dy$ b) $\int_0^{\pi/4} \int_0^{a\sec\theta} r\cos^2\theta\ dr\ d\theta$

c) $\int_0^{\pi/4} \int_0^{a\sec\theta} \cos^2\theta\ dr\ d\theta$ d) $\int_0^a \int_y^a r\cos^2\theta\ dr\ d\theta$

Ans: b

Q 37) To convert the given Cartesian coordinates to polar coordinates the substitutions are

a) $x = r\cos\theta,\quad y = r\sin\theta,\quad dxdy = r\,dr\,d\theta$

b) $x = r\cos\theta,\quad y = r\sin\theta, dxdy = dr\,d\theta$

c) $x = r\ \cos\theta,\quad y = -r\ \sin\theta,\ dxdy = r\,dr\,d\theta$

d) $x = r\ \sin\theta,\quad y = r\ \cos\theta,\ dxdy = r\,dr\,d\theta$

Ans: a

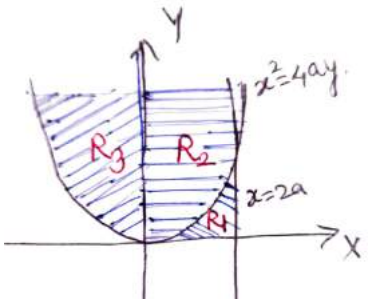
Q 38) To find the area outside the circle $r = a\cos\theta$ and inside the circle $r = 2a\cos\theta$ the limits of r will vary from

a) $a\cos\theta \ \ to\ \ 2a\cos\theta$ b) $0\ \ to\ \ a\cos\theta$

c) $0\ \ to\ \ 2a\cos\theta$ d) $0\ \ to\ \ r$

Ans: d

Q 39) For $\iint_R xydxdy$, where R is the region bounded by X-axis x = 2a and $x^2 = 4ay$, then the required region is



a) R_1 b) R_2

c) R_3 d) $R_1 + R_2$

Ans: a

Q 40) If the equation of circle is $r = a\cos\theta$, then radius of this circle is

a) a b) a/2

c) a/4 d) 2

Ans: b

Subject: Mathematics-II
(Question Bank MCQs) Module IV: Vector Calculus

1. $\bar{a}\times(\bar{b}\times\bar{c})+\bar{b}\times(\bar{c}\times\bar{a})+\bar{c}\times(\bar{a}\times\bar{b})=$
(a) 5 (b) 0 (c) 2 (d) 1
Ans: (b)

2. $\hat{i}\times(\bar{a}\times\hat{i})+\hat{j}\times(\bar{a}\times\hat{j})+\hat{k}\times(\bar{a}\times\hat{k})=$
(a) 2 (b) $\bar{a}$ (c) $-2\bar{a}$ (d) $2\bar{a}$
Ans: (d)

3. $\bar{a}\times(\bar{b}\times\bar{c})=$
(a) $(\bar{a}\circ\bar{c})\bar{b}-(\bar{a}\circ\bar{b})\bar{c}$ (b) $(\bar{a}\circ\bar{b})\bar{c}$ (c) $(\bar{a}\circ\bar{b})\bar{c}$ (d) $(\bar{a}\circ\bar{b})\bar{c}-(\bar{a}\circ\bar{c})\bar{b}$
Ans: (a)

4. $(\bar{b}\times\bar{c})\circ[(\bar{c}\times\bar{a})\times(\bar{a}\times\bar{b})]=$
(a) $(\bar{a}\times\bar{b})\bar{c}$ (b) $\{(\bar{b}\times\bar{a})\circ\bar{c}\}^2$ (c) $\{(\bar{a}\times\bar{b})\circ\bar{c}\}^2$ (d) $\bar{a}\circ(\bar{b}\times\bar{c})$
Ans: (c)

5. $(\bar{b}\times\bar{c})\circ(\bar{a}\times\bar{d})+(\bar{c}\times\bar{a})\circ(\bar{b}\times\bar{d})+(\bar{a}\times\bar{b})\circ(\bar{c}\times\bar{d})=$
(a) 1 (b) 3 (c) 2 (d) 0
Ans: (d)

6. $(\bar{A}\times\bar{B})\circ(\bar{C}\times\bar{D})=$
(a) 0 (b) $(\bar{A}\circ\bar{D})\circ(\bar{B}\circ\bar{C})$ (c) $(\bar{A}\circ\bar{C})(\bar{B}\circ\bar{D})$ (d) $(\bar{A}\circ\bar{C})(\bar{B}\circ\bar{D})-(\bar{A}\circ\bar{D})\circ(\bar{B}\circ\bar{C})$
Ans: (d)

7. $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})=$
(a) $[\bar{b}\bar{c}\bar{d}]\bar{a}-[\bar{a}\bar{c}\bar{d}]\bar{b}$ (b) $[\bar{a}\bar{c}\bar{d}]\bar{b}-[\bar{b}\bar{c}\bar{d}]\bar{a}$ (c) $[\bar{b}\bar{c}\bar{d}]\bar{a}+[\bar{a}\bar{c}\bar{d}]\bar{b}$ (d) $[\bar{a}\bar{c}\bar{d}]\bar{b}+[\bar{b}\bar{c}\bar{d}]\bar{a}$
Ans: (b)

8. $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})=$
(a) $[\bar{a}\bar{b}\bar{d}]\bar{c}-[\bar{a}\bar{b}\bar{c}]\bar{d}$ (b) $[\bar{b}\bar{c}\bar{d}]\bar{a}-[\bar{a}\bar{c}\bar{d}]\bar{b}$ (c) $[\bar{a}\bar{b}\bar{c}]\bar{d}+[\bar{a}\bar{b}\bar{d}]\bar{c}$ (d) $[\bar{a}\bar{b}\bar{d}]\bar{c}+[\bar{a}\bar{b}\bar{c}]\bar{d}$
Ans: (a)

9. If $\bar{a}\times(\bar{b}\times\bar{c})=(\bar{a}\times\bar{b})\times\bar{c}$ then
(a) $(\bar{a}\circ\bar{c})\times\bar{b}=0$ (b) $(\bar{a}\times\bar{c})\circ\bar{b}=0$ (c) $(\bar{a}\times\bar{c})\times\bar{b}=0$ (d) None of these
Ans: (c)

10. $(\bar{b}\times\bar{c})\times(\bar{a}\times\bar{d})+(\bar{c}\times\bar{a})\times(\bar{b}\times\bar{d})+(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})=$
(a) 0 (b) $-2[\bar{a}\bar{b}\bar{c}]\bar{d}$ (c) $2[\bar{a}\bar{b}\bar{c}]\bar{d}$ 2 (d) None of these
Ans: (b)

11. A particle moves along the curve $x=t^3+1, y=t^2, z=2t+5$ where *t* is the time, then the component of velocity at *t*=1in the direction of $\hat{i}+\hat{j}+3\hat{k}$ is
(a) $\sqrt{11}$ (b) $\sqrt{10}$ (c) $\sqrt{13}$ (d) $\sqrt{15}$
Ans: (a)

12. A particle moves along the curve $\bar{r} = (t^3 - 4t)\hat{i} + (t^2 + 4t)\hat{j} + (8t^2 - 3t^3)\hat{k}$ where t is the time, then the tangential component of acceleration at t=2 is

(a) 15 (b) 16 (c) 20 (d) 13

Ans: (b)

13. If $\bar{t}_1 = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\bar{t}_2 = \hat{i} - 2\hat{j} + 3\hat{k}$ be two tangent vectors to the curve, then angle between them is

(a) $\cos^{-1}\left(\frac{7}{3}\right)$ (b) $\cos^{-1}\left(\frac{3}{7}\right)$ (c) $\sin^{-1}\left(\frac{3}{7}\right)$ (d) $\sin^{-1}\left(\frac{7}{3}\right)$

Ans: (b)

14. If $\bar{a} = t^2\hat{i} - t\hat{j} + (2t+1)\hat{k}$ and $\bar{b} = 2t\hat{i} + \hat{j} - t\hat{k}$, then at $t = 0$ $\frac{d}{dt}(\bar{a} \times \bar{b}) =$

(a) $2\hat{i} + 2\hat{j}$ (b) $-2\hat{i} + \hat{j}$ (c) $-\hat{i} + 2\hat{j}$ (d) $-2\hat{i} + 2\hat{j}$

Ans: (d)

15. A particle moves so that its position vector is given by $\bar{r} = (\cos wt)\hat{i} + (\sin wt)\hat{j}$ where w is constant, then $\bar{r} \times \bar{v} =$

(a) w (b) constant vector (c) constant scalar (d) None of these

Ans: (b)

16. If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $grad(r) =$

(a) $\frac{\bar{r}}{r}$ (b) 0 (c) $\frac{r}{\bar{r}}$ (d) r

Ans: (a)

17. If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $grad(r^n) =$

(a) $\frac{\bar{r}}{r^{n-2}}$ (b) $n^{r-2}\bar{r}$ (c) $\frac{r^{n-1}}{\bar{r}}$ (d) $nr^{n-2}\bar{r}$

Ans: (d)

18. If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $div(\bar{r}) =$

(a) -3 (b) 3 (c) 0 (d) 5

Ans: (b)

19. If $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $curl(\bar{r}) =$

(a) $\frac{\bar{r}}{r}$ (b) 1 (c) 0 (d) r

Ans: (c)

20. The directional derivative of ϕ is maximum in the direction of

(a) ϕ (b) $\nabla\phi$ (c) $\Delta\phi$ (d) None of these

Ans: (b)

21. The directional derivative of $\phi = 4e^{2x-y+z}$ at the point $(1,1,-1)$ in the direction towards the point $(-3,5,6)$ is

(a) $-\frac{2}{9}$ (b) $-\frac{10}{9}$ (c) $\frac{20}{9}$ (d) $-\frac{20}{9}$

Ans: (d)

22. The value of the constant $a \ \& \ b$ so that the surface $ax^2 - byz = (a+2)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at the point $(1,-1,2)$ are
(a) 5, 1 (b) 0, 2 (c) 5/2, 1 (d) 1, 2
Ans: (c)

23. If $div\overline{F} = 0$ then $\overline{F}$ is
(a) irrotational (b) rotational (c) solenoidal (d) None of these
Ans: (c)

24. If vector field $\overline{F}$ is irrotational then
(a) $curl\overline{F} = 0$ (b) $curl\overline{F} = 1$ (c) $curl\overline{F} \neq 0$ (d) $curl\overline{F} \neq 1$
Ans: (a)

25. Work done by the force $\overline{F}$ along the path C from point A to B where ϕ a scalar potential is given by
(a) $\phi(A) - \phi(B) = 0$ (b) $\phi(B-A) = 0$ (c) $\phi(A-B) = 0$ (d) $\phi(B) - \phi(A) = 0$
Ans: (d)

26. The directional derivative of $\frac{1}{r}$ in the direction of $\bar{r}$ where $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ is
(a) $\frac{1}{r}$ (b) $-\frac{1}{r}$ (c) $-\frac{1}{r^2}$ (d) r
Ans: (c)

27. The value of n for which vector field $r^n\bar{r}$ will be solenoidal where $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ is
(a) 3 (b) -3 (c) 1 (d) - 2
Ans: (b)

28. The value of constant a so that the vector $\overline{V} = (x+3y)i + (y-2z)j + (x+az)k$ is solenoidal is
(a) -2 (b) -3 (c) -1 (d) 2
Ans: (a)

29. The divergence of $\overline{V} = (xyz)i + (3x^2y)j + (xz^2 - y^2z)k$ at the point $(2,-1,1)$.
(a) 15 (b) 13 (c) 16 (d) 14
Ans: (d)

30. The curl of $\overline{V} = (xyz)i + (3x^2y)j + (xz^2 - y^2z)k$ at the point $(2,-1,1)$.
(a) $2\hat{i} + 2\hat{j} - 3\hat{k}$ (b) $2\hat{i} - 3\hat{j} - 14\hat{k}$ (c) $-\hat{i} + 2\hat{j} + \hat{k}$ (d) $-2\hat{i} + 2\hat{j} + 3\hat{k}$
Ans: (b)

31. $curl\,grad\,\phi =$ -------, where ϕ is scalar point function.
(a) 0 (b) 1 (c) 6 (d) 4
Ans: (a)

32. $div\,curl\overline{A} =$ -------, where $\overline{A}$ is vector point function.
(a) 1 (b) 0 (c) 2 (d) 5
Ans: (b)

33. $div(\phi\overline{A}) =$

(a) $\phi div\overline{A} + grad\phi \bullet \overline{A}$ (b) $\phi div\overline{A} - grad\phi \bullet \overline{A}$ (c) $\phi div\overline{A} - grad\phi \times \overline{A}$ (d) None of these

Ans: (a)

34. $curl(\phi\overline{A}) =$

(a) $\phi curl\overline{A} - grad\phi \times \overline{A}$ (b) $\phi curl\overline{A} + grad\phi \bullet \overline{A}$ (c) $\phi curl\overline{A} + grad\phi \times \overline{A}$ (d) None of these

Ans: (c)

35. A vector field $\overline{A} = (x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is

(a) rotational (b) conservative (c) solenoidal (d) None of these

Ans: (b)

36. The value of constants a , b , c so that the vector

$\overline{F} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$ is irrotational are

(a) 1, 3, 2 (b) 3, 2, -1 (c) 1, 0, -1 (d) 4, 2, -1

Ans: (d)

37. If $\overline{A}$ is irrotational where $\overline{A} = (y + z)\hat{i} + (z + x)\hat{j} + (x + y)\hat{k}$ then its scalar potential ϕ is

(a) $xy - yz + zx$ (b) $xy + yz - zx$ (c) $xy + yz + zx$ (d) None of these

Ans: (c)

38. If $\phi = x^2 y + xz^3$ be the scalar potential for the conservative vector field $\overline{F}$ then the work done in moving an object in this field from $(1,-2,1)$ to $(3,1,4)$ is

(a) 202 (b) 200 (c) 201 (d) 210

Ans: (a)

39. If $\overline{F} = \sin(a\sin\theta)\hat{i} + a\cos\theta[1 + \cos(a\sin\theta)]\hat{j}$ and $\frac{d\overline{r}}{d\theta} = (-a\sin\theta)\hat{i} + (a\cos\theta)\hat{j}$ then the value of $\oint_C \overline{F} \circ d\overline{r}$ from $\theta = 0\ to\ \theta = 2\pi$ is

(a) π (b) $2\pi a^2$ (c) πa (d) πa^2

Ans: (d)

40. If $\overline{A} \circ \frac{d\overline{r}}{d\theta} = 4 + 8\cos 2\theta + 8\sin 2\theta$ then the value of $\oint_C \overline{A} \circ d\overline{r}$ from $\theta = 0\ to\ \theta = 2\pi$ is

(a) 8π (b) 2π (c) π (d) 4π

Ans: (d)

Multiple Choice Questions

Module - 5 - Statistics

1. Which of the following is one of the normal equations of $y = a + bx$

A) $\sum xy = na + b\sum x^2$ B) $\sum y = na + b\sum x$

C) $\sum y = a + b\sum x$ D) None of these

A-B

2. Which of the following is one of the normal equations of $y = a + bx$

A) $\sum xy = a\sum x + b\sum x^2$ B) $\sum y = na + b\sum x$

C) $\sum y = a + b\sum x$ D) None of these

A-A

3.For the following values of x and y the equation of the best fit straight line $y = a + bx$ is------

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

A) $y = 1.976 - 0.506x$ B) $y = -1.976 + 0.506x$

C) $y = -1.976 - 0.506x$ D) $y = 1.976 + 0.506x$

A-D

4. Which of the following is one of the normal equations of $y = ax + b$

A) $\sum xy = a\sum x^2 + b\sum x$ B) $\sum y = na + b\sum x$

C) $\sum y = a + b\sum x$ D) None of these

A-A

5. Which of the following is one of the normal equations of $y = ax + b$

A) $\sum xy = na + b\sum x^2$ B) $\sum y = na + b\sum x$

C) $\sum y = a + b\sum x$ D) $\sum y = a\sum x + nb$

A-D

6. Which of the following is one of the normal equations of $y = mx + c$

A) $\sum xy = nm + c\sum x^2$ B) $\sum y = nm + c\sum x$

C) $\sum y = m + c\sum x$ D) $\sum y = m\sum x + nc$

A-D

7. Which of the following is one of the normal equations of $y = a + bx + cx^2$

A) $\sum y = na + b\sum x + c\sum x^2$ B) $\sum y = a\sum x + b\sum x^2 + c\sum x^3$

C) $\sum xy = a\sum x^2 + b\sum x^3 + c\sum x^4$ D) None of these

A-A

8. Which of the following is one of the normal equations of $y = a + bx + cx^2$

A) $\sum y = a + b\sum x + c\sum x^2$ B) $\sum xy = a\sum x + b\sum x^2 + c\sum x^3$

C) $\sum xy = a\sum x^2 + b\sum x^3 + c\sum x^4$ D) None of these

A-B

9. Which of the following is one of the normal equations of $y = a + bx + cx^2$

A) $\sum xy = na + b\sum x + c\sum x^2$ B) $\sum y = a\sum x + b\sum x^2 + c\sum x^3$

C) $\sum x^2 y = a\sum x^2 + b\sum x^3 + c\sum x^4$ D) None of these

A-C

10.For the following values of x and y the equation of the best fit parabola $y = a + bx + cx^2$ is-

x	0	2	5	10
y	4	7	6.4	-6

A) $y = 4.1 + 1.979x + 0.299x^2$ B) $y = 4.1 - 1.979x + 0.299x^2$

C) $y = 4.1 - 1.979x - 0.299x^2$ D) $y = 4.1 + 1.979x - 0.299x^2$

A-D

11. Which of the following is one of the normal equations of $y = ax^2 + bx + c$

A) $\sum y = nc + b\sum x + a\sum x^2$ B) $\sum xy = a\sum x + b\sum x^2 + c\sum x^3$

C) $\sum x^2 y = a\sum x^2 + b\sum x^3 + c\sum x^4$ D) None of these

A-A

12. Which of the following is one of the normal equations of $y = ax^2 + bx + c$

A) $\sum y = na + b\sum x + c\sum x^2$ B) $\sum xy = a\sum x + b\sum x^2 + c\sum x^3$

C) $\sum x^2 y = c\sum x^2 + b\sum x^3 + a\sum x^4$ D) None of these

A-C

13. Which of the following is one of the normal equations of $y = a + bx^2$

A) $\sum xy = na + b\sum x^2$ B) $\sum y = na + b\sum x$

C) $\sum y = na + b\sum x^2$ D) None of these

A-C

14. Which of the following is one of the normal equations of $y = a + bx^2$

A) $\sum xy = na + b\sum x^2$ B) $\sum x^2 y = a\sum x^2 + b\sum x^4$

C) $\sum y = a\sum x + b\sum x^2$ D) None of these

A-B

15.For the following values of x and y the equation of the best fit parabola $y = a + bx^2$ is------

x	0	1	2	3
y	2	4	10	15

A) $y = 2.7 - 1.44x^2$ B) $y = -2.7 + 1.44x^2$

C) $y = 2.7 + 1.44x^2$ D) $y = -2.7 - 1.44x^2$

A-C

16. Which of the following is one of the normal equations of $y = ax^2 + b$

A) $\sum xy = na + b\sum x^2$ B) $\sum y = a\sum x^2 + nb$

C) $\sum y = na + b\sum x^2$ D) None of these

A-B

17.Which of the following is one of the normal equations of $y = ax^b$

A) $\sum \log xy = n\log a + b\sum \log x$ B) $\sum \log xy = n\log a + x\sum \log b$

C) $\sum \log x \log y = \log a\sum \log x + b\sum (\log x)^2$ D) None of these

A-C

18.Which of the following is one of the normal equations of $y = ab^x$

A) $\sum \log y = a\log n + \log b\sum x$ B) $\sum \log y = n\log a + \log b\sum x$

C) $\sum \log y = n\log a + \log x\sum b$ D) None of these

A-B

19. For the following values of x and y the equation of the best fit curve $y = ab^x$ is------

x	2	3	4	5	6
y	144	172.3	207.4	248.8	298.5

A) $y = 100(1.2)^x$ B) $y = -100(1.2)^x$

C) $y = -100(-1.2)^x$ D) $y = 100(-1.2)^x$

A-A

20.Which of the following is one of the normal equations of $y = ae^{bx}$

A) $\sum \log y = n\log a + b\log e\sum x$ B) $\sum \log y = a\log n + b\log e\sum x$

C) $\sum \log y = n \log a + \log x \sum b \log e$ D) None of these

A-A

21.For the following values of x and y the equation of the best fit curve $y = ae^{bx}$ is------

x	0	2	4
y	5.012	10	31.62

A) $y = -4.642e^{0.46x}$ B) $y = 4.642e^{0.46x}$

C) $y = 4.642e^{-0.46x}$ D) $y = -4.642e^{-0.46x}$

A-B

22.Two variables are said to be ----------if increase or decrease in one variable is accompanied by increase or decrease in the other variable.

A)correlated B) unrelated C)related D) none of these.

A-A

23. Karl Pearson's defined the coefficient r = ----------

A) $\frac{\sum XY}{\sqrt{\sum X . \sum Y}}$ B) $\frac{\sum X^2 Y^2}{\sqrt{\sum X^2 . \sum Y^2}}$ C) $\frac{\sum XY}{\sqrt{\sum X^2 . \sum Y^2}}$ D) $\frac{\sum X^2 Y^2}{\sqrt{\sum X . \sum Y}}$

A-C

24. The value of coefficient of correlation always varies from _____.

A) 0 to 1 B) -1 to 0 C)-1 to 1 D) none of these.

A-C

25. The equation of line of regression of y on x is ----------.

A) $x = b_0 + b_1 y$ B) $y = a_0 + a_1 x$ C) $y = a_0 + a_1 y$ D) $y = a_0 + a_1 x^2$.

A-B

26. The equation of line of regression of y on x is useful to predict the value of ----------.

A)y B) x C) both x and y D) None of these

A-A

27. The equation of line of regression of x on y is useful to predict the value of ----------.

A) y B) x C) both x and y D) None of these

A-B

28. If r=0 then lines of regression are----------.

A) parallel B)coincide C) perpendicular D) None of these

A-C

29. If r=1 then lines of regression are ----------.

A) different B)equal C) perpendicular D) None of these

A-B

30. Point of intersection of lines of regression is----

A) $(\bar{y} \quad \bar{x})$ B) $(\bar{x} \quad \bar{y})$ C) $(\bar{x} \quad \bar{x})$ D) $(\bar{y} \quad \bar{y})$

A-B

31. The equation of line of regression of x on y is ----------.

A) $x = b_0 + b_1 y$ B) $y = a_0 + a_1 x$ C) $x = b_0 + b_1 x$ D) $x = b_0 + b_1 y^2$.

A-A

32. The regression coefficient of y on x is given by a_1 =----------.

A) $r^2 \frac{\sigma_y}{\sigma_x}$ B) $r^2 \frac{\sigma_y}{\sigma_x}$ C) $r \frac{\sigma_x}{\sigma_y}$ D) $r \frac{\sigma_y}{\sigma_x}$.

A-D

33. The coefficient of correlation r in terms of regression coefficients is given by --------

A) $r = \sqrt{a_1 b_1}$ B) $r = \sqrt{a_1^2 b_1}$ C) $r = \sqrt{a_1 b_1^2}$ D) $r = a_1 b_1$

A-A

34. The coefficient of rank correlation r = ----------.

A) $1-\frac{\sum d_i^{\,2}}{n(n^2-1)}$ B) $1-\frac{6\sum d_i}{n(n^2-1)}$ C) $1-\frac{6\sum d_i^{\,2}}{n(n-1)}$ D) $1-\frac{6\sum d_i^{\,2}}{n(n^2-1)}$.

A-D

35. Two lines of regression are given by $x+2y-5=0$ and $2x+3y-8=0$ then the mean values ofx and y are ----------

A) 1, 2 B) 2, 1 C)-1, -2 D) -2,-1

A-A

36. If lines of regression are $5y-8x+17=0$ and $2y-5x+14=0$ and if $\sigma_y^{\,2}=16$ then the standard deviation of x is _____

A) 4 B) -4 C)-2 D) 2

A-D

37. If lines of regression are $5y-8x+17=0$ and $2y-5x+14=0$ then the coefficient of correlation between x and y is--------

A) 0 B) 0.8 C)0.99 D) None of these

A-B

38. In rank correlation if all the d's are zero then r = -------

A) 0 B) 1 C)-1 D) None of these

A-B

39. If six values of X and Y are 2, 4, 5, 6, 8, 11 and 18, 12, 10, 8, 7, 5 respectively then sum of the differences of ranks of corresponding values of X and Y is

A) 4 B) 3 C)2 D) 0

A-D

40. For the following values of X and Ythe rank correlation coefficient is r = --------

X	2	4	5	6	8	11
Y	18	12	10	8	7	5

A) 1 B) -1 C)0.5 D) 0.8

A-B

MCQs Finite Differences Module 6

1. The shifting operator is denoted by _____.

A) E B) nabla C) omega D) T

Ans: A

2.$\Delta f(x)$ =

A) f (x + h) B) f (x) − f (x + h)

(c) f (x + h) − f (x) D) f (x) − f (x − h)

AnsC

3. E ≡

A) 1 + Δ B) 1 − Δ

C)1 + ∇ D) 1 − ∇

AnsA

4. If C is a constant then Δ C =

A) C B) Δ

C) Δ^2 D) 0

Ans: D

5. If m and n are positive integers then $\Delta^m \Delta^n f(x)$ =

A) $\Delta^{m+n} f(x)$ B) $\Delta^m f(x)$

C) $\Delta^n f(x)$ D) $\Delta^{m-n} f(x)$

AnsA

6. E $f(x)$ =

A) f (x − h) B) f (x) C) f (x + h) D) f (x + 2h)

AnsC

7. For the given points (x_0 , y_0) and (x_1 , y_1) the Lagrange's formula is

A) y(x) = $\frac{x-x_1}{x_0-x_1}y_0 + \frac{x-x_0}{x_1-x_0}y_1$ B) y(x) = $\frac{x_1-x}{x_0-x_1}y_0 + \frac{x-x_0}{x_1-x_0}y_1$

C) y(x) = $\frac{x-x_1}{x_0-x_1}y_1 + \frac{x-x_0}{x_1-x_0}y_0$ D) y(x) = $\frac{x_1-x}{x_0-x_1}y_1 + \frac{x-x_0}{x_1-x_0}y_0$

AnsA

8. If f (x) = x^2 + 2x + 2 and the interval of differencing is unity then

Δf(x) is ?

A) 2x – 3 B) 2x + 3 C) x + 3 D) x − 3

AnsB

9. The process of finding the values inside the interval (x_0, x_n) is called

A) Interpolation B) Extrapolation

C) Iterative D) Polynomial equation

Ans A

10. The Delta of power two is called the ____order difference operator.

A) First B) second C) Third D) Fourth

Ans B

11. For the given distributed data find the value of$\Delta^3 y_0$ is?

x	3.60	3.70	3.65	3.75
y	36.59 8	38.47 5	40.44 7	42.52 1

A) 0.095 B) 0.007 C) 1.872 D) 0.123

Ans B

12. Find Δ (x + cos x)?

A) 1+2sin(x+1/2).sin1/2 B) 1 -2sin(x+1/2).sin1/2

C) 1 -2sin(x -1/2).sin1/2 D) 1+2sin(x -1/2).sin1/2

Ans B

13. If *f(1)* = 2, f(2) = *4* and *f(4)* = 16, what is the value of f(3)using Lagrange's interpolation formula?

A) 8 (B) $8\frac{1}{3}$ (C) $8\frac{2}{3}$ D) 9

Ans C

14. In Simpson's 1/3rd rule of integration is exact for all polynomials of degree not exceeding_____.

A) 4. B) 1. C) 3. D) 2.

Answer: D

15. In Simpson's 3/8th rule which is applicable only when_____.

A) n is multiple of 3 B) n is multiple of 6.

C)n is multiple of 8. D) n is multiple of 24.

Answer: A

16. In Simpson's 1/3rd rule the number of intervals must be _____.

A) Multiple of 3. B) Multiple of 6.

C).Odd. D) Even

Answer: D

17.The degree of y(x) in Trapezoidal Rule is _____.

A)1. B)2. C)3. D)6.

Answer: A

18. The degree of y(x) in Simpson's (3/8)th is_____.

A)1. B) 2. C) 3. D) 6.

Answer: C

19. In Simpson's (1/3)rd Rule the number of intervals _____.

A)odd. B)even. C) multiple of 3. D) multiple of 6.

Answer: B

20. Interpolating polynomial is also known as_____.

A)smoothing function. B) interpolating function.

C) collocation polynomial. D) interpolating formula.

Answer: D

21. In Lagrange's interpolation formula, the value of l_0(x) = _____.

A)$\frac{x_1-x_0}{x-x_0}$ B)$\frac{x-x_1}{x_0-x_1}$ C) $\frac{x-x_1}{x-x_0}$. D)$\frac{x_1-x_0}{x_2-x_0}$

Answer: B

22. The Trapezoidal rule for =$\int_{x_0}^{x_4} y\,dx$

A)$\frac{h}{2}\{ y_0 + 2(y_1 + y_2 + y_3) + y_4\}$. B)$\frac{h}{3}\{ y_0 + 2(y_1 + y_2 + y_3) + y_4\}$.

C) $\frac{h}{2}\{ y_0 + 2y_1 + 4(y_2 + y_3) + y_4\}$. D)$\frac{h}{2}\{ y_0 + y_1 + y_2 + y_3 + y_4\}$

Answer: A

23. In deriving the trapezoidal formulae, the arc of the curve y=f(x)

over each subinterval is replaced by its_____.

A) Straight line. B) Ellipse. C) Chord D) Tangent line.

Answer: C

24. In Simpson's rule will give exact result, if the entire curve y=f(x)

is itself a ____.

A) Straight line. B) Chord. C) Parabola. D)Tangent line.

Answer: C

25. Difference equation is used in :

A) Discrete time analysis B) Continuous time analysis

C) Digital analysis D) None of the mentioned

Answer: A

26. Match the CORRECT pairs.

Numerical Integration Scheme	Order of Fitting Polynomial
P. Simpson's 3/8 Rule	1. First
Q. Trapezoidal Rule	2. Second
R. Simpson's 1/3 Rule	3. Third

A) P-2, Q-1, R-3 B) P-3, Q-2, R-1 C) P-1, Q-2, R-3 D) P-3, Q-1, R-2

Answer: D

27. The (n+1)th forward difference of nth degree of polynomial is ----

A) Zero B) a constant C) a variable D) None of these

Answer: A

28. Order of the difference equation $x_{n+2} - x_{n+1} + 2x_n = n$ is ----

A) Zero B) 1 C) 2 D) 3

Answer: C

29. The interpolating function may be a straight line passing through the points. This is called the trapezoidal rule.

A) TRUE B) FALSE C) Can be true or false D) Can not say

Answer: A

30. The first forward difference of constant function is

A) Constant B) 0 C) 1 D) None of these

Answer: B

31. In the function y = f(x) , the independent variable x is called

A) Entry B) Argument C) Intermediate D) interpolation

Answer: B

32. The following function(s) can be used for interpolation:

A) polynomial B) exponential

C) trigonometric (D) all of the above

Answer: D

33. Which of the following statement is true?

A) Simpson's 1/3rd rule can be applied when the range is divided into even number of subintervals

B) Simpson's 3/8th rule can be applied when the range is divided into number of subintervals, which must be a multiple of 3.

C) Trapezoidal rule can be applied for any number of subintervals

D) All of the above

Answer: D

34. If $\emptyset(E)y_n$ = F(n) and F(n) = 0, then solution of equation is given by

A) Only PI B) Only CF

C) CF + PI D) all of the **above**

Answer: B

35. CF of Auxiliary Equation (A.E.) is(m^2- 5m + 6) = 0

A) $c_{1(-}2)^n + c_2(-3)^n$ B) $c_1 2^n + c_2 3^n$

C) $c_1(-2)^n + c_2 3^n$ D) $c_1 2^n + c_2(-3)^n$

Answer: B

36. Find P.I. of difference equation: $y_{n+2} - 3y_{n+1} + 2y_n = 5^n$

A) $\frac{1}{5}12^n$ B) 5^n

C) $\frac{1}{12}5^n$ D) None of these

Answer: C

37. Find value of $[\ 1 - \Delta + \frac{2}{3}\Delta^2\text{-----}]\ [\ n^{(2)} + n^{(1)}\ ]$

A) $[n^2 - 2n + \frac{1}{3}\ ]$ B) $[n^2 - 2n\ ]$

C) $[n^{(2)} - 2n^{(1)} + \frac{1}{3}\ ]$ D) $[n^2 + \frac{1}{3}\ ]$

Answer: A

38. $\Delta^3(3x^{(2)}) =$ --

A) 0 B) 3

C) 2 D) 6

Answer: A

39. If $\Delta^5 y = 0$ then the number of entries are

A) 6 B) 5

C) 4 D) 3

Answer: B

40. $\frac{1}{\Delta^3}(x^{(3)}) =$?

A) $\frac{x^{(6)}}{120}$ B) $\frac{x^{(5)}}{20}$

C) $\frac{x^{(2)}}{2}$ D) $\frac{x^{(4)}}{4}$

Answer: A