BUDDHA SERIES

(Unit Wise Solved Question & Answers)

Programme – B.Sc. Maths 1st year 1st Semester

College – Buddha Degree College

(DDU Code-859)

Department: Science

Course title: Physics

Faculty Name: Mr.Faizaan Mahmood

UNIT-1

1. Which of the following quantities is a scalar?
A) Velocity
B) Force
C) Temperature
D) Displacement

Answer: C

2. A pseudo-vector changes sign under:
A) Rotation
B) Translation
C) Reflection
D) Inversion

Answer: C

3. Under coordinate inversion, a true vector:
A) Remains unchanged
B) Changes direction
C) Reverses direction
D) Becomes zero

Answer: C

4. Which operation yields a scalar from two vectors?
A) Cross product
B) Wedge product
C) Dot product
D) Vector product

Answer: C

5. The cross product of two vectors results in a:
A) Scalar
B) Pseudo-vector
C) True vector
D) Scalar field

Answer: B

6. An example of a pseudo-scalar is:
A) Mass

B) Electric potential
C) Magnetic flux
D) Charge

Answer: C

7. Under reflection, a scalar:
A) Becomes negative
B) Remains unchanged
C) Doubles in magnitude
D) Becomes a vector

Answer: B

8. Which of the following represents a pseudo-vector?
A) Displacement
B) Magnetic field
C) Force
D) Velocity

Answer: B

9. The wedge product of two vectors geometrically represents:
A) Volume
B) Angle
C) Area
D) Distance

Answer: C

10. Which of the following is NOT affected by coordinate rotation?
A) Vector components
B) Magnitude of vector
C) Direction of vector
D) Scalar fields

Answer: D

11. The triple scalar product of vectors A, B, and C gives:
A) Area
B) Volume
C) Angle
D) Displacement

Answer: B

12. A physical example of a pseudo-scalar is:
A) Angular momentum

B) Work done
C) Torque
D) Magnetic flux

Answer: D

13. Which of the following is a true scalar?
A) Magnetic field
B) Energy
C) Angular velocity
D) Electric field

Answer: B

14. Which operation among vectors is anti-commutative?
A) Dot product
B) Cross product
C) Scalar multiplication
D) Vector addition

Answer: B

15. A vector that is unchanged under inversion is called:
A) True vector
B) Pseudo-vector
C) Scalar
D) Pseudo-scalar

Answer: B

16. The dot product of two perpendicular vectors is:
A) 1
B) 0
C) Maximum
D) Undefined

Answer: B

17. Position vector represents:
A) Distance between two points

B) Magnitude only
C) Location of a point from the origin
D) Direction only

Answer: C

18. Which of the following is invariant under rotation?
A) Components of vector
B) Vector magnitude
C) Direction of vector
D) Axes

Answer: B

19. Which operation among vectors results in a scalar in 3D?
A) A x B
B) A · B
C) A + B
D) A – B

Answer: B

20. In 3D, cross product of two unit vectors is:
A) Always zero
B) A unit vector perpendicular to both
C) Scalar
D) Undefined

Answer: B

21. Vector subtraction can be interpreted as:
A) A change in magnitude only
B) A change in direction only
C) A vector from one point to another
D) A scalar

Answer: C

22. The vector triple product A x (B x C) is equal to:
A) A · B x C
B) B (A · C) - C (A · B)
C) C x B x A
D) Zero

Answer: B

23. The cross product of two vectors in the same direction is:
A) Zero
B) Maximum
C) Unit vector
D) Infinite

Answer: A

24. Displacement is defined as:
A) Total path length
B) Vector from initial to final point
C) Final position
D) Initial position

Answer: B

25. What is the dimension of the scalar triple product?
A) L
B) L^2
C) L^3
D) No dimension

Answer: C

26. The cross product of vectors A and B is orthogonal to:
A) A only
B) B only
C) Both A and B
D) None

Answer: C

27. The result of dot product is maximum when angle between vectors is:
A) 0 degrees
B) 90 degrees
C) 180 degrees
D) 45 degrees

Answer: A

28. An example of a true vector is:
A) Torque

B) Magnetic field
C) Angular momentum
D) Velocity

Answer: D

29. Which of the following best describes pseudo-scalar?
A) Scalar changing under inversion
B) Vector remaining same under rotation
C) Scalar unchanged under reflection
D) Scalar changing sign under reflection

Answer: D

30. The magnitude of position vector is:
A) Distance from origin
B) Displacement
C) Constant
D) Infinite

Answer: A

31. A scalar product is independent of:
A) Angle between vectors
B) Direction of vectors
C) Coordinate rotation
D) Magnitude of vectors

Answer: C

32. The result of vector addition lies:
A) On a line perpendicular to the vectors
B) Between the vectors
C) Beyond the longer vector
D) On one of the vectors

Answer: B

33. The minimum value of dot product is when angle between vectors is:
A) 0
B) 90
C) 180
D) 45

Answer: C

34. The scalar triple product is non-zero only if:
A) Vectors lie in same plane
B) Vectors are orthogonal

C) Vectors are coplanar
D) Vectors are non-coplanar

Answer: D

35. A wedge product of vectors A and B corresponds geometrically to:
A) Scalar
B) Directed area
C) Unit vector
D) Dot product

Answer: B

36. Cross product obeys which rule:
A) Commutative
B) Distributive over addition
C) Symmetric
D) Associative

Answer: B

37. The component form of a vector in 3D is:
A) $A = Ax + Ay$
B) $A = Ax\,i + Ay\,j + Az\,k$
C) $A = Ax\,i + Ay\,j$
D) $A = Ax\,j + Az\,k$

Answer: B

38. Inversion of coordinates refers to:
A) Mirror image transformation
B) Scaling vector length
C) Multiplying position vector by -1
D) Changing axes label

Answer: C

39. Which of the following is a pseudo-vector product?
A) $A + B$
B) $A \cdot B$
C) $A \times B$
D) A / B

Answer: C

40. The dot product of vectors is:

A) A pseudo-vector
B) A pseudo-scalar
C) A scalar
D) A vector

Answer: C

Unit-2

1. The gradient of a scalar field is a:

A) Scalar

B) Vector
C) Pseudo-vector
D) Tensor

Answer: B

2. Divergence of a vector field gives:
A) A scalar
B) A vector
C) A tensor
D) A pseudo-vector

Answer: A

3. Curl of a vector field results in:
A) Scalar
B) Pseudo-scalar
C) Vector
D) Pseudo-vector

Answer: D

4. The gradient gives the direction of:
A) Maximum decrease
B) Zero change
C) Maximum increase
D) Minimum increase

Answer: C

5. The divergence of a field indicates:
A) Rate of rotation
B) Expansion or compression
C) Direction
D) Zero change

Answer: B

6. Which of the following represents the curl of a vector field?
A) $\nabla \times A$

B) $\nabla \bullet A$
C) ∇A
D) $A \bullet \nabla$

Answer: A

7. Line integrals are used to compute:
A) Area
B) Volume
C) Work done along a path
D) Scalar fields

Answer: C

8. Surface integral of a vector field measures:
A) Flux through a surface
B) Volume
C) Line integral
D) Gradient

Answer: A

9. Volume integral of divergence gives:
A) Surface integral
B) Curl
C) Gradient
D) Zero

Answer: A

10. Gauss's divergence theorem relates:
A) Volume integral of divergence to surface flux
B) Line integral to scalar field
C) Gradient to flux
D) Curl to work

Answer: A

11. Stokes' theorem relates:
A) Surface integral of divergence to volume
B) Line integral around a loop to surface curl
C) Gradient to scalar field
D) Volume to divergence

Answer: B

12. Green's theorem applies to:
A) 3D volume
B) 2D closed curves
C) 1D fields
D) Infinite surfaces

Answer: B

13. The Helmholtz theorem states that a vector field is determined by:
A) Gradient and scalar field
B) Its divergence and curl
C) Line integral only
D) Surface area

Answer: B

14. Which theorem expresses conservation of flux?
A) Stokes' theorem
B) Green's theorem
C) Gauss's theorem
D) Helmholtz theorem

Answer: C

15. The gradient of potential represents:
A) Force
B) Work
C) Acceleration
D) Mass

Answer: A

16. Curl is associated with:
A) Expansion
B) Rotation
C) Gradient
D) Pressure

Answer: B

17. The Dirac delta function is used to:
A) Smooth a function
B) Represent a point source
C) Describe waves
D) Show divergence

Answer: B

18. Dirac delta function has an integral value of:
A) 0
B) ∞
C) 1
D) Undefined

Answer: C

19. $\nabla \bullet (\nabla \times A)$ equals:
A) $\nabla^2 A$
B) 0
C) ∇A
D) A

Answer: B

20. $\nabla \times (\nabla f)$ equals:
A) f
B) ∇f
C) 0
D) $\nabla^2 f$

Answer: C

21. Which operator gives scalar field from vector field?
A) Gradient
B) Curl
C) Divergence
D) Laplacian

Answer: C

22. Line integral over closed loop of conservative field is:
A) Positive
B) Negative
C) Zero
D) Maximum

Answer: C

23. A conservative field has:
A) Zero gradient
B) Zero divergence
C) Zero curl
D) Constant value

Answer: C

24. In vector calculus, ∇ represents:
A) Dot product
B) Nabla operator
C) Cross product
D) Integral

Answer: B

25. Flux of vector field is given by:
A) $\int A \bullet dr$
B) $\iint A \bullet dS$
C) $\iiint A \bullet dV$
D) $\nabla \times A$

Answer: B

26. Which of the following is used in fluid flow and electromagnetism?
A) Gradient only
B) Divergence and curl
C) Curl only
D) Scalar field

Answer: B

27. The Laplacian of a scalar field is:
A) $\nabla \bullet \nabla f$
B) $\nabla \times \nabla f$
C) ∇f
D) $\nabla^2 f$

Answer: D

28. What is the physical meaning of divergence in electromagnetism?
A) Magnetic flux
B) Electric field line source density
C) Energy flow
D) Magnetic lines

Answer: B

29. Which theorem allows evaluation of line integral using surface integral?
A) Gauss
B) Green
C) Helmholtz
D) Gradient

Answer: B

30. The Dirac delta function is zero:
A) Everywhere
B) Except at origin
C) Only at infinity
D) For all x

Answer: B

31. Line integral of electric field gives:
A) Power
B) Voltage
C) Force
D) Energy

Answer: B

32. A solenoidal field has:
A) Zero divergence
B) Zero curl
C) Constant divergence
D) Infinite flux

Answer: A

33. Which operator measures rate of change in a direction?
A) Gradient
B) Curl
C) Divergence
D) Integral

Answer: A

34. The unit of divergence is:
A) m
B) m^2
C) 1/m
D) m^3

Answer: C

35. The divergence of curl of any vector field is:
A) Non-zero
B) Equal to field itself
C) Always zero
D) Constant

Answer: C

36. Green's theorem is a special case of:
A) Gauss theorem
B) Stoke's theorem
C) Laplace theorem
D) None

Answer: B

37. Curl of velocity field gives:
A) Divergence
B) Pressure
C) Rotation or vorticity
D) Flux

Answer: C

38. Divergence theorem is also known as:
A) Maxwell theorem
B) Gauss's theorem
C) Helmholtz theorem
D) Gradient theorem

Answer: B

39. The integral of Dirac delta function over all space is:
A) Zero
B) Infinity
C) One
D) Undefined

Answer: C

40. A vector field is irrotational if:
A) Divergence is zero
B) Curl is zero
C) Gradient is constant
D) Vector has no direction

Answer: B