

END OF SEMESTER EXAMINATIONS, NOVEMBER - 2018

MATHEMATICAL PHYSICS

SUBJECT CODE: 12UAPH05

MAJOR: B.SC (PHYSICS) / *Physics CCA*
 TIME : 3 HOURS

SEMESTER : V
 MAX. MARKS: 75

SECTION - A (10 X 1 = 10)Answer All the questions:

1. $\nabla \cdot \nabla =$
 - a) $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$
 - b) $\frac{\partial}{\partial x} + \frac{\partial}{\partial y}$
 - c) 0
 - d) 1
2. Divergence of a scalar field will change
 - a) scalar to vector
 - b) vector to scalar
 - c) scalar to another scalar
 - d) vector to another vector
3. If the conjugate transpose of a matrix is its inverse, the matrix is called as
 - a) unitary
 - b) orthogonal
 - c) null
 - d) rectangular
4. For an analytic function,
 - a) $\partial u = \partial v$
 - b) $\frac{\partial u}{\partial y} = \frac{\partial u}{\partial v}$
 - c) $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}$
 - d) $u = v^2$
5. $\overline{0} = ?$
 - a) ∞
 - b) 0
 - c) 1
 - d) 100
6. In the integral equation corresponding to gammafunction, x will be
 - a) equal to zero
 - b) equal to one
 - c) greater than zero
 - d) lesser than zero
7. The Minimum number of coordinates required to describe the configuration of the system is called as
 - a) Cartesian coordinate
 - b) spherical coordinate
 - c) generalised coordinate
 - d) polar coordinate
8. Force $F =$
 - a) P_t
 - b) \dot{P}
 - c) P_t^2
 - d) P_t^3
9. $T + V =$
 - a) H
 - b) L
 - c) H^2
 - d) L^2
10. $\frac{\partial H}{\partial P_k} =$
 - a) Q_k
 - b) QP
 - c) \dot{Q}_k
 - d) Q_k / P_k

SECTION - B (5 X 4 = 20)Answer All the questions:

11. a) Distinguish between surface and volume integral.

(OR)

- b) Give the physical significance of curl.

12. a) Find the characteristic equation of the matrix $\begin{pmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{pmatrix}$. Also find out its eigen value.

(OR)

- b) Check whether Z^{-1} is an analytic function or not.
13. a) List the properties of gamma function.
- (OR)
- b) Discuss about the different forms of beta function.
14. a) Explain the various types of constraints.
- (OR)
- b) Obtain an expression for the period of oscillation of a simple pendulum.
15. a) Write short notes on phase space and Hamiltonian function H.
- (OR)
- b) Describe the physical significance of H and list the advantages of Hamiltonian approach.

SECTION – C (5 X 9 = 45)

Answer All the questions:

16. a) Explain angular acceleration, centripetal acceleration and radial acceleration.

(OR)

- b) State and prove stoke's theorem.

17. a) Find the eigen values and eigen vector of the matrix $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$.

(OR)

- b) Derive Cauchy's integral formula and hence evaluate $\int_C \frac{z^2+1}{z^2-1} dz$ if C is circle of unit radius with centre at $z=1$.

18. a) Prove that (i) $\Gamma(1/2) = \sqrt{\pi}$ (ii) Write about transformation of gamma function.

(OR)

- b) Establish the relation between beta and gamma function. Show that $\Gamma(m)\Gamma(1-m) = \frac{\pi}{\sin m\pi}$.

19. a) Express momentum and force in terms of generalised coordinates.

(OR)

- b) Derive Lagrange's equation from Hamilton's principle.
20. a) Deduce canonical equation from variational principle.

(OR)

- b) Apply Hamilton's equation to describe the
- (i) Particle coming near the surface of earth.
- (ii) Particle in central field force.
