Code No. 16139/Core

FACULTY OF SCIENCE

M.Sc. I Semester (CBCS) Examination, September 2021

Subject: Astrophysics/Physics & Applied Electronics

Paper – I : Mathematical Physics

Time: 2 Hours **Max. Marks: 80**

PART – A

Note: Answer any five questions. **(5 x 7 = 35 Marks)**

1 Write the Rodrigue's formula for Legendre's differential equation.

2 Define the Beta and Gamma functions.

3 Prove the recurrence relation of $H_n(-x) = (-1)^n H_n(x)$ for Hermite polynomials.

4 Show that Bessel's function of the first kind $J_{-n}(x) = (-1)^n J_n(x)$.

5 Find the Fourier transform of the function $f(x) = e^{i\omega x}$.

6 Write the properties of Inverse Laplace Transforms.

7 Determine the eigen value of the matrix $\begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$.

8 What is Transpose of a matrix? Show that $(AB)^T = B^T A^T$; A and B being comfortable for multiplication.

PART – B

Note: Answer any three questions. **(3 x 15 = 45 Marks)**

9 Write Legendre's differential equation and find it's solution by power series method.

10 (a) Obtain Generating function for Bessel's function of the first kind.
(b) Discuss orthogonality of Bessel's function of the first kind.

11 solve the Hermite differenting equation $\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2ny = 0$ and find its polynomials solution, 'n' being a positive integer.

12 Obtain Generating function and Rodrigue's formula for Laguerre differential equation.

13 What are Fourier Sine and Cosine transforms? Find the Fourier Sine and Cosine transform of second derivative of the function f(t).

14 (a) Define the Lapalace Transform and write any five properties of Laplace Transform.
(b) Obtain the Laplace Transform of $\sin x$.

15 (a) Describe the Eigen values and Eigen vectors.
(b) Write the characteristic equation of a matrix by Cayley-Hamilton's theorem.

16 Explain Co-variant, Contra variant and mixed tenson with suitable examples.

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FACULTY OF SCIENCE

M.Sc. I – Semester (CBCS) Examination, September 2021

Subject: ASTROPHYSICS/PHYSICS AND APPLIED ELECTRONICS

Paper –II: Classical Mechanics

Time: 2 Hours **Max. Marks: 80**

PART – A

Note: Answer any five questions. **(5x7 = 35 Marks)**

1 What is Minkowski space? Describe the different zones of a Space-time diagram?

2 Explain what is meant by a pseudo force with an example

3 Obtain the Lagrangian' s equations of motion for an L-C circuit.

4. Explain the Principle of Virtual work with examples.

5 Define Principle of least Action

6 Evaluate the Poisson bracket [P_y^2 , L_x]

7 What are normal modes? Explain their significance

8 Define Stable, unstable and neutral equilibrium

PART – B

Note: Answer any three questions. **(3x15 = 45 Marks)**

9 Describe the transformation from the space set of axes to the body set of axes in terms of Euler angles

10 Explain the Lorentz Transformation in a four-space vectors and write about four velocity, energy-momentum vectors with few examples.

11 State the D'Alembert's Principle and deduce the Lagrangian equation of motion from D'Alembert's equation

12 Obtain Lagrargian equation for a charged particle in an electro-magnetic field.

13 (a) Deduce the Hamilton's equations

(b) Write the Hamilton's equations for a Projectile motion of a body

14 Define Canonical Transformation and write four generating functions

15 Describe the Vibrations in a Linear-triatomic molecule.

16 Explain normal coordinates Lagrangian formulation for continuous systems.

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