Total Printed Page:4 Roll No............

PHY-501

Mathematical Physics and Classical Mechanics

M.Sc. PHYSICS (MSCPHY-12/13/16/17)

First Year, Examination-2019

Time: 3 Hours **Max. Marks: 80**

....

Note:- This paper is of Eighty (80) marks divided into two (02) Section A and B. Attempt the question contained in these sections according to the detailed instructions given therein.

Section-A

(Long Answer Type Question)

Note:- Section - A contains five (05) long answer-type questions of fifteen (15) marks each. Learners are required to answer any three (03) questions only. (3×15=45)

1. Establish the relation.

$$J_n(x) J_{-n}(x) - J_n'(x) J_{-n}(x) = -\frac{2 \sin n\pi}{\pi x}$$

2. Use finite fourier transforms to solve

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

Where U(0, t) = 0, U(π, t) = 0

U(x, 0) = 2x under the limit

O < x < π, t > 0

Give physical interpretation of the problem.

3. Surface of a sphese is a two dimensional Riemannian space. Find its fundamental tensor.

4. Describe the D – Alembert's principle.

Use it to derive the Lagrangian equation of motion. How do you include the damping forces in this equation?

5. Describe numerical interpolation and discuss inverse interpolation.

Section-B

(Short Answer Type Question)

Note:- Section-B contains eight (08) short answer type questions of seven (07) marks each. Learners are required to answer any five (05) questions only. (5×7=35)

1. Find out solution of Legendre differential equation :

$$(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$$

Where n is positive integer. Why $P_n(x)$ is considered more important than $Q_n(x.)$

2. Show that in the expansion of

$e^{2xt-t\,2}$ Coefficient of t^n is $H_n\,(x)/n!$

3. Find fourier transform of function f(t)

$$f(t)=\begin{cases}\text{Sinkt} & |t|\le \pi/2\\ 0 & |t|>\pi/2\end{cases}$$

Where K is an odd positive integer.

4. Find out Laplace transform of f(t) given by

$$f(t) = \begin{cases} \cos(t - 2\pi/3) & \text{for } t > 2\pi/3 \\ 0 & \text{for } t < 2\pi/3 \end{cases}$$

5. Discuss algebraic operations of tensors.

6. Explain the Hamilton – Jacobi equation for Hamilton's principal function.

7. Derive Hamilton's principle by differential method.

8. Explain numerical solutions of ordinary differential equation with an example.

*****