

R.C.S. COLLEGE, MANJHAUL

(A CONSTITUENT UNIT OF L.N. MITHILA UNIVERSITY, DARBHANGA)

BEGUSARAI (BIHAR) PIN - 851 127



Ref. No.

Date 18/10/2021

Assignment-MJCPHY05

Subject: Physics

Name of the Course: -Mathematical Physics-II & Introduction to computational Methods

Course Code: MJCPHY05

Semester: Semester-IV, Session: 2023-2027

Answer all questions.

Q.1

The amplitude $U(\rho, \varphi, t)$ of a vibrating circular membrane of radius a satisfies the wave equation

$$\nabla^2 U - \frac{1}{v^2} \frac{\partial^2 U}{\partial t^2} = 0.$$

Here v is the phase velocity of the wave fixed by the elastic constants and whatever damping is imposed. Estd - 1965

(a) Show that a solution is

$$U(\rho, \varphi, t) = J_m(k\rho)(a_1 e^{im\varphi} + a_2 e^{-im\varphi})(b_1 e^{i\omega t} + b_2 e^{-i\omega t}).$$

Q.2

Evaluate

$$\int_0^\infty \frac{(\ln x)^2}{1+x^2} dx.$$

by contour integration to obtain

$$\frac{\pi^3}{8}$$
.



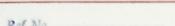
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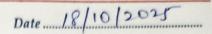
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Assignment-MJCPHY07

Subject: Physics

Name of the Course: - OPTICS

Course Code: MJCPHY07

Semester: Semester-IV, Session: 2023-2027

Answer all questions.

Q.1

Discuss in detail the Fraunhoffer Diffraction Pattern formed by N parallel slits, each of width b; the distance between two consecutive slits is assumed to be d.

Q.2

Explain in detail, with proper diagrams, the basic principle involved in the formation of LASER light through the lasing action. LLEGE, MANS



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Ref. No.

Date 18/10/2025

Assignment-MJCPHY06

Subject: Physics

Name of the Course: -Electrodynamics and Electromagnetism

Course Code: MJCPHY06

Semester: Semester-IV, Session: 2023-2027

Answer all questions.

Q.1

Imagine two parallel infinite sheets, carrying uniform surface charge $+ \sigma$ (on the sheet at z = d) and $-\sigma$ (at z = 0). They are moving in the y direction at constant speed v. What is the electromagnetic momentum in a region of area A?

Consider a resonant cavity produced by closing off the two ends of a rectangular Estd - 1965 wave guide, at z = 0 and at z = d, making a perfectly conducting empty box. Show that the resonant frequencies for both TE and TM modes are given by

 $\omega_{lmn} = c \pi \sqrt{\left(\frac{l}{d}\right)^2 + \left(\frac{m}{a}\right)^2 + \left(\frac{n}{b}\right)^2}$ for integers l, m, and n. Find the associated electric and magnetic fields.



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Date ... 18/10/2025

Assignment-MICPHY04

Subject: Physics

Name of the Course: - ELECTRICITY AND MAGNETISM

Course Code: MICPHY04

Semester: Semester-IV, Session: 2023-2027

Answer all questions.

Derive an expression for the resonance frequency and quality factor of a series LCR circuit.

Explain Ampere's law in magnetized material and find the expression for H inside and outside of a long copper rod of radius R carrying a uniformly COLLEGE, MANJHA distributed (free) current I.