M. A. COLLEGE OF ENGINEERING, KOTHAMANGALAM - 686 666
(GOVT. AIDED AUTONOMOUS ENGINEERING COLLEGE)
FIRST SESSIONAL EXAMINATION, OCTOBER 2026
B24PH1T01A - ENGINEERING PHYSICS A
FIRST SEMESTER
(S_1ECE_A, S_1ECE_B, S_1CSE, S_1DS_A, S_1DS_B, S_1AIML)

Time: 1.5 Hours **Maximum Marks: 40**

Answer all questions.

PART A

1. Discuss population inversion in a laser.

(CO1, 3 Marks)

2. Explain the principle of operation of an optical fibre.

(CO1, 3 Marks)

3. Why are matter waves not observable for macroscopic objects?

(CO2, 3 Marks)

4. State the general form of the uncertainty principle.

(CO2, 3 Marks)

PART B

5. (a) With the help of a neat labelled diagram, derive the expression for the Numerical Aperture of an optic fibre.

(CO1, 10 Marks)

(b) At what temperature are the rates of spontaneous and stimulated emissions equal? Take $\lambda = 632.8$ nm

(CO1, 4 Marks)

6. (a) What are matter waves? Write the expression for de-Broglie wavelength. Deduce expressions for the de-Broglie wavelength of an electron *i*) accelerated from rest through a potential of V volts and *ii*) Having kinetic energy E.

(CO2, 10 Marks)

(b) Compare the uncertainties in position of an electron and a baseball of mass **145 g**. Both are assumed to have the same uncertainty in speed of **1 mm/s**.

(CO2, 4 Marks)

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VISION

Excellence in education through resource integration.

MISSION

The institution is committed to transform itself into a centre of excellence in Technical Education upholding the motto "Knowledge is Power". This is to be achieved by imparting quality education to mould technically competent professionals with moral integrity, ethical values and social commitment, and by promoting innovative activities in the thrust areas emerging from time to time.

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