



SCHOOL OF ADVANCED SCIENCES  
CONTINUOUS ASSESSMENT TEST - II  
FALL SEMESTER 2025-2026

Programme Name & Branch : Integrated M.Tech &  
Course Code and Course Name : IAPHY101L and Engineering Physics  
Faculty Name(s) : Dr. K. Senthilnathan, Dr. P. Ramesh Babu, Dr. D. Rajan  
Babu and Dr. A. Ruban Kumar  
Class Number(s) : VL2025260105465, 5468, 5472 & 5474  
Date of Examination : 06-10-2025 @ 9.30 AM  
Exam Duration : 90 minutes Maximum Marks: 50  
General instruction(s): Answer All Questions

M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

**Course Outcomes:**

CO2: **Apply** quantum mechanical ideas to microscopic systems.

CO3: **Examine** the characteristics and working of lasers by applying the Einstein's theory of stimulated emission.

CO4: **Describe** the primary components of a typical optical fiber communications system and their working principles.

| Q. No | Question                                                                                                                                                                                                                                                                                                                      | M  | CO | BL |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|
| 1.    | a) Identify a device that works based on the tunneling of electrons and discuss the working of the same with a neat diagram.                                                                                                                                                                                                  | 5  | 2  | 3  |
|       | b) Two copper nanowires are insulated by a copper oxide nano-layer that provides a 10eV potential barrier. Estimate the tunnelling probability between the nanowires by 7eV electrons through a 5 nm thick oxide layer.                                                                                                       | 5  |    |    |
| 2.    | Identify two problems that you will encounter during the construction a laser with two energy levels. Provide your possible solutions to overcome these two scientific problems with appropriate energy level diagrams. Besides, compare the characteristics of a light source in your class room with that of a laser light. | 10 | 3  | 3  |
| 3.    | Name a laser that works based on the vibrational energy levels. Discuss its construction and working with a neat energy level diagram.                                                                                                                                                                                        | 10 | 3  | 2  |
| 4.    | a) What is coherence? Distinguish spatial coherence from that of temporal coherence.                                                                                                                                                                                                                                          | 5  | 3  | 3  |
|       | b) In a GaAs laser diode, $R_1 = R_2 = 0.34$ for uncoated facets and material absorption (volume loss coefficient) is 10/cm. Calculate the threshold gain coefficient, $k_{th}$ , for a laser diode of length 500 $\mu\text{m}$ .                                                                                             | 5  |    |    |
| 5.    | a) In an optical fiber, the refractive indices of core and cladding are 1.46 and 1.45, respectively. Find the critical angle, critical propagation angle, acceptance angle and numerical aperture.                                                                                                                            | 5  | 4  | 3  |
|       | b) Mention the three major advantages of optical fiber communication over other conventional communication systems. State the conditions for total internal refraction to take place in optical fibers.                                                                                                                       | 5  |    |    |

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