B. Sc. in Electrical and Electronic Engineering   **03 November, 2021**
Winter semester   **Time: 2:30 – 4:00 PM**

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination   **Winter Semester: 2020 - 2021**
Course Number: Phy 4121   **Full Marks: 75**
Course Title: Engineering Physics I   **Time: 1.5 Hours**

There are **6 (Six)** questions. Answer **4 (Four)** questions according to the instructions mentioned in Sec A and Sec B. The symbols have their usual meanings. The examination is **Online**. Marks of each question and corresponding CO and PO are written in the brackets. **Q1 and Q6 are compulsory**.

Sec A
Q1 is compulsory, Answer any one from Q2 and Q3.

1.	(a) How will you distinguish soft and hard ferromagnetic materials. Mention some of their applications.	[4.5+7+8]
		(CO1)
	(b) Explain the origin of magnetic moment at the atomic level. Evaluate magnetic moment of an electron in the first Bohr orbit.	(CO2)
	(c) Explain the classification of magnetic materials. Show schematically magnetization (**M**) as a function of applied magnetic field (**H)** behaviour for all types of magnetic materials, and briefly explain these behaviors.	CO3 (PO 2, PO 4)
2.	(a) Briefly explain the term 'Meissner effect'.	[4+7+7]
	(b) Write down the characteristics of superconductors? Explain the influence of: (i) magnetic field, (ii) frequency of the ac signal, and (iii) isotopes on superconducting behaviour.	(CO2, CO3) (PO 1, PO 2)
	(c) Briefly discuss the formation of Cooper pairs and energy gap in superconductors on the basis of BCS theory.	
3.	(a) Distinguish between Type-I and Type-II superconductors.	[7+11]
	(b) Explain the terms permeability (μ), susceptibility, magnetic induction (B), magnetic field (H), and magnetization (M) with reference to magnetism. Deduce possible relationship among them.	(CO2, CO3) (PO 1, PO 4)

4.	(a) Write down your concept on the resolving power of an optical instrument. (b) "The smallest detail that can be resolved using an optical microscope is about the same size as the wavelength of light being used" justify this statement. (c) Deduce the missing orders for a double slit Fraunhofer diffraction pattern, if the slit widths are 0.16 mm and they are 0.8 mm apart.	[5+8+5] CO-4 PO-4 CO-4 PO-4 CO-4 PO-4
5.	(a) Distinguish between polarized and unpolarized light. Why sound waves cannot be polarized? (b) How Brewster's law is use for the production of plane polarized light by reflection? (c) Write down the working principle of a Nicol prism. How Nicol prism can be used as a polarizer as well as an analyzer of light.	[5+8+5] CO-5 PO-5 CO-5 PO-5 CO-5 PO-5
6.	(a) Define specific rotation. Determine the specific rotation of the given sample of sugar solution if the plane of polarization is turned through $13.2°$. The length of the tube containing 20 % sugar solution is 30 cm. (b) How does the output current of a photoelectric cell depend on the frequency and intensity of light? (c) When a monochromatic point source of light is at a distance 0.4 m from a photoelectric cell, the stopping potential and the saturation photocurrent are respectively 0.6 V and 20 mA. If the same source is placed 0.6 m away from the photocell, what will be the new stopping potential and saturation photocurrent?	[8+5+6.5] CO-5 PO-5 CO-6 PO-6 CO-6 PO-6