International University - VNUHCM
Department of Physics

Midterm Examination

Date: November 2nd, 2021; Duration: 150 minutes

Open book; **Online**

SUBJECT: Physics 3 (ID: PH015IU)	
Approval by Chair of Department of Physics Signature  Phan Bảo Ngọc	Lecturer: Signature  Dương Hoài Nghĩa
Proctor 1 Signature Full name:	Proctor 2 Signature Full name:
STUDENT INFO	
Student name: **Student ID:**	

INSTRUCTIONS: the total of point is 100 (equivalent to 20% of the course)

1. *Purpose:*
   - Test your knowledge in electricity and magnetism (CLO 1)
2. *Requirement:*
   - Read carefully each question and answer it following the requirements
   - Write the answers and draw models CLEAN and TIDY directly in the exam paper
   - Submit your exam including this paper inside

QUESTIONS

Q1. (20 marks) Three charged particles are placed at the vertices of a right triangle as shown in Figure Q1 with a = 1 mm. Find and sketch the electrostatic force acting on each charged particle if Q_1 = 1 nC, Q_2 = -1 nC, Q_3 = -1 nC.

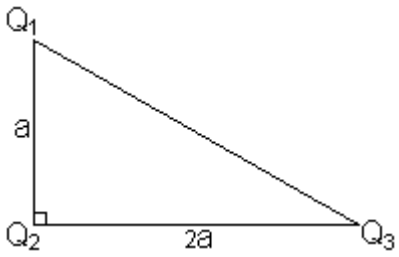

Figure Q1

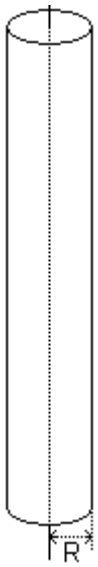

Figure Q2

Q2. (20 marks) Consider an infinitely long solid cylinder of radius R = 1 cm as shown in Figure Q2. The cylinder has a non-uniform volume charge density $\rho = 2r^2$ where r is the radial distance from the axis of the cylinder (r < R). Find and sketch the electric field as function of the radial distance from the axis of the cylinder.

Q3. (20 marks) Determine the current through each resistor in the circuit as shown in Figure Q3 where ε_1 = 9 V, ε_2 = 6 V, R_1 = 2 Ω, R_2 = 1 Ω, R_3 = 1 Ω, R_4 = 1 Ω, R_5 = 2 Ω, R_6 = 2 Ω.

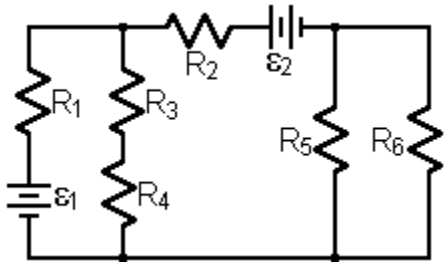

Figure Q3

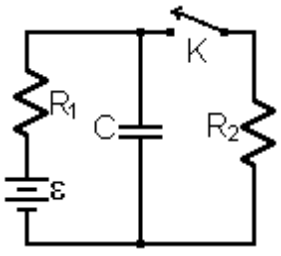

Figure Q4

Q4. (20 marks) Given the circuit in Figure Q4 with ε = 24 V, R_1 = 20 kΩ, R_2 = 20 kΩ, C = 100 μF. The switch K is open for very long time and is suddenly closed. Find and sketch the voltage across the capacitor as function of time.

Q5. (20 marks) Consider a spherical capacitor with 2 concentric dielectrics between the 2 spherical plates as shown in Figure Q5. The inner plate has radius $r_0 = 1$ mm. The dielectric 1 has dielectric constant $k_1 = 2$ and outer radius $r_1 = 2$ mm. The dielectrics 2 has dielectric constant $k_2 = 3$ and outer radius $r_2 = 3$ mm. Let +Q be the charge on the inner plate. Using Gauss'law find the electric field in the dielectrics. Deduce the potential difference between the plates and the capacitance C of the capacitor.

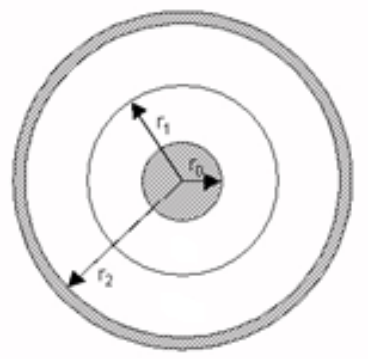

Figure Q5

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