College of Industrial Technology
King Mongkut's University of Technology North Bangkok

เลขที่นั่งสอบ

Final Examination of Semester 1 **Year:** 2018
Subject: 340151 Electrical Materials and Calculation **Section:** 5-6
Date: 3 December 2018 **Time:** 10.00-12.00
Name..... ID..... EP.....

Instructions:

1. The examination has 9 pages (including this page), 9 questions and a total score of 60 points.
2. Write all your solution and answers on this examination sheet.
3. This is a closed book examination.
4. You are not allowed to leave the exam room during the first 1 hour after the beginning of the exam.
5. You are not allowed to open the exam papers or start to answer before the proctor's permission.
6. You are not allowed to use the restroom during the exam except in case of an emergency.
7. No documents are allowed to be taken out of the examination room.
8. Calculator is allowed in the examination.
9. Electronic communication devices are NOT allowed in the examination room.

Cheating in the exam is considered an extremely serious offence which will result in expulsion from the University.

1. Match the definition/function of the components as written in Table 1 with the alphabet as follows. (10 points)

A. Conductor screen
B. Thermoplastic
C. Thermosetting
D. Insulating Paper
E. Silk and Cotton Fiber
F. Conductor Sheath
G. Filter
H. Bedding
I. Individual Screen
J. Armour

Table 1: Definition/Function

No.	Alphabet	Definition/Function
1	.....	protect bundle hit each other
2	.....	never soften if already harden
3	.....	soften on heating and harden again on cooling
4	.....	To minimize electrostatic stresses
5	.....	keep the bundle together
6	.....	insulation wrapped around conductors in communication circuits
7	.....	satisfactory insulation when impregnated with mineral oil
8	.....	mechanical protect the bundle
9	.....	protect noise or radiation
10	.....	keep electromagnetic radiation

2. In Table 2, fill in the doping process and its doping effect of each semiconductor type. (8 points)

Table 2: Doping Process

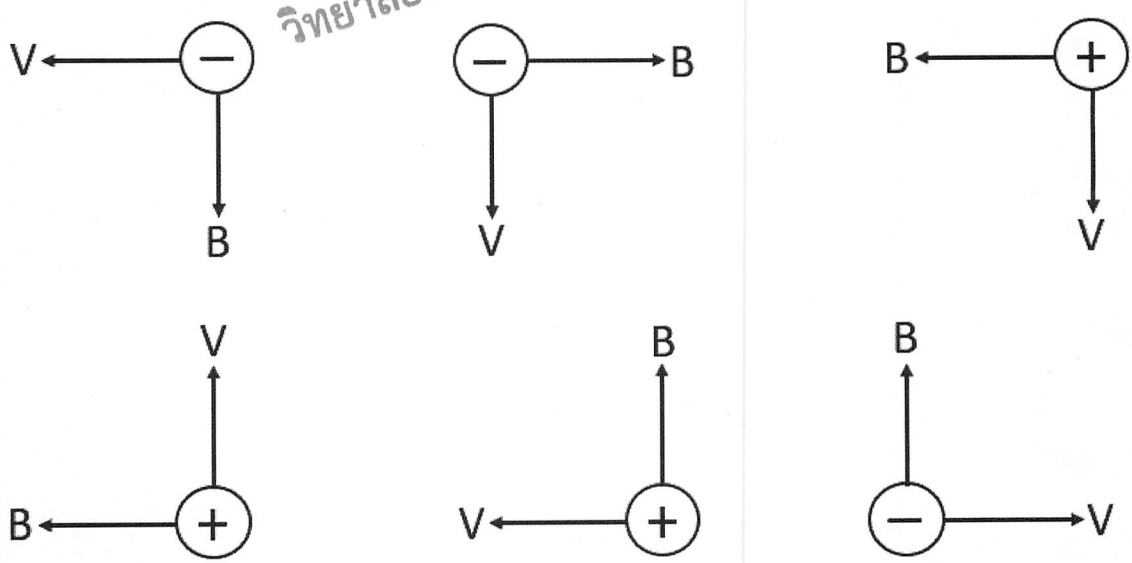
Semiconductor Type	Doping by	Electron	Current	Resistor
N-type	.....	.....	.....	.....
P-type	.....	.....	.....	.....

3. In Table 3, fill in the effect of transformer oil temperature. (6 points)

Table 3: Oil Temperature Effect

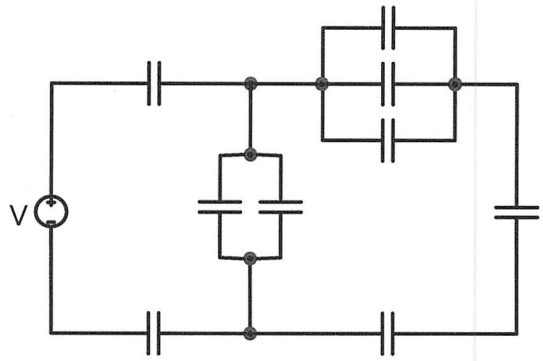
Oil Temperature	Rubber Bag Size	Oil Volume	Air Flowing
decreasing	.....	.....	.....
increasing	.....	.....	.....

4. Draw the direction of the magnetic force of the figures below. Also, specify "in" or "out" on those force direction. Note: "in" means into the viewer, while "out" means out of the viewer. (6 points)



Note: In question 5-9, please show step-by-step how to get the solutions. Both quantity and unit must be answered. (30 points)

5. What is the total capacitance of the capacitor combination? Assume that the value of each capacitor is 4 pF. (5 points)



6. The 56 pF capacitor includes two parallel plates with a total surface area of 80 cm^2 and Formica dielectric medium. The power supply to the capacitor is 25 V. Assume that ε_0 and ε_r of Formica are 8.84 pF/m and 4.75, respectively.

6.1 What is the distance between the two plates of the capacitor? (3 points)

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6.2 What is the energy stored in the capacitor? (2 points)

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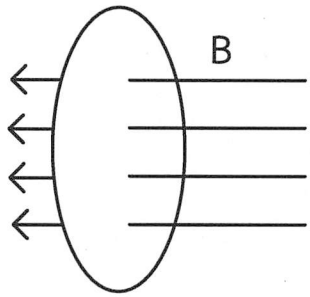
7. The magnetic field lines are passing through the sphere with the area equal to 65 cm^2. The magnetic flux is 82 weber. The proton, $1.6x10^{-19}$ C, moves perpendicular to the magnetic field from the bottom to the top of the sphere with 30 m/s.



7.1 What is the magnetic field? (2 points)

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7.2 What are the magnitude and the direction of the magnetic force? (3 points)

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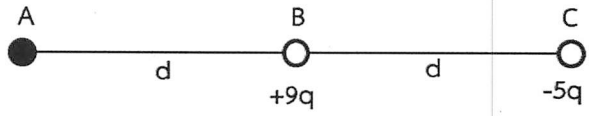
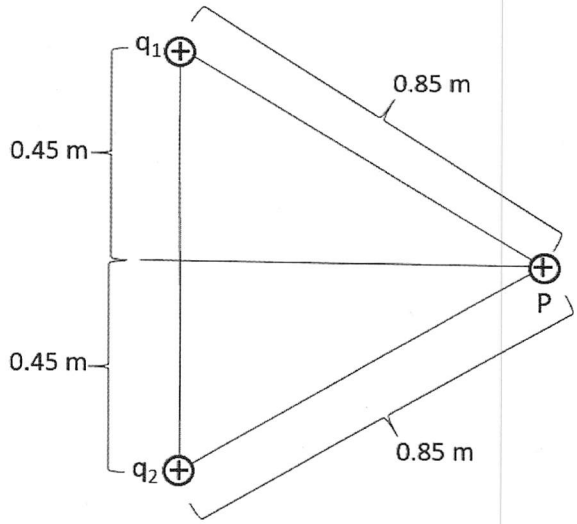
8. The charges "B" and "C" are +9q and -5q, respectively. Point "A" has a positive charge. Assume that d=330 mm., q=1 nC and k=9x10^9 N.m^2/C^2.

   8.1 What are the magnitude and direction of the Electric Field at Point "A"? (5 points)



9. The two charges of +55 nC and +85 nC are placed at q_1 and q_2, respectively. Another positive charge is placed at the "P" point. Assume that $k=9\times10^9$ N.m^2/C^2.



9.1 What is the electric field at the "P" point? (8 points)

9.2 What is the electric force at the "P" point when there is +70 nC placed at that point? (2 points)

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