Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	PHYSICS III
COURSE CODE	:	DAS 24603
PROGRAMME CODE	:	3 DAU
EXAMINATION DATE	:	JUNE / JULY 2016
DURATION	:	2 HOURS AND 30 MINUTES
INSTRUCTION	:	SECTION A:ANSWER **ALL** QUESTIONS SECTION B: ANSWER **TWO (2)** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **TEN(10)** PAGES

SECTION A

Q1 (a) Draw a magnetic field lines for like poles and unlike poles.

(4 marks)

(b) An electron is moving at 3 x 10^6 m/s perpendicular to a 0.5 T magnetic field. Calculate the magnitude of the acceleration of the electron.

(4 marks)

(c) Three long, straight, parallel wires, A, B and C, carrying currents of 3 A, 4 A and 5 A, respectively as shown in **Figure Q1(c)**. Compute the magnetic force experienced by a 35 cm length of wire C.

(10 marks)

(d) A circular coil consists of 45 turns of wire and has a radius of 40 cm. It is placed in a magnetic field and is oriented so that the magnetic field lines are parallel to the normal of the area of the coil. Find the average induced e.m.f. in the coil if the magnetic field increases from 0.10 T to 0.45 T in 300 ms.

(7 marks)

Q2 (a) i) Explain briefly the phenomenon of Photoelectric Effect.

(3 marks)

ii) Give **TWO (2)** applications of Photoelectric Effect.

(2 marks)

(b) Find the threshold wavelength for a photon to produce an electron-positron pair.

(4 marks)

(c) Cesium has a work function of 1.8 eV. When the cesium is illuminated with light of a certain wavelength, the electron ejected from the surface have kinetic energies ranging from 0 to 2.2 eV. Calculate the wavelength of the light.

(3 marks)

(d) Hydrogen's lime spectrums are formed by a series of lines and each line in a given series corresponds to a different value of n.

i) Calculate the wavelength, λ and of the photon emitted by this electron if it jumps to the final stage $n_f = 2$ from $n_1 = 3$, $n_2 = 4$, $n_3 = 5$ respectively.

(7 marks)

ii) Calculate the energy level, E of the photon emitted by this electron if it jumps to the final stage $n_f = 2$ from $n_1 = 3$, $n_2 = 4$, $n_3 = 5$ respectively.

(6 marks)

SECTION B

Q3 (a) State Coulomb's Law and its equation.

(3 marks)

(b) Referring to the **Figure Q3(b)** :

i) Determine the magnitude and direction of electric field at origin (0,0).

(13 marks)

ii) Calculate the electric potential at origin (0,0).

(9 marks)

Q4 (a) State the function of capacitor and its symbol.

(2 marks)

(b) The charge on a capacitor is 60 μC when the voltage across it is 24 V

i) Determine the capacitance of the capacitor

(2 marks)

ii) If the voltage across this capacitor is increased to 100 V, compute the charge on the capacitor.

(2 marks)

iii) Find the capacitance of a parallel plate capacitor that has square plates with lateral dimensions of 122 mm on one side, a plate separation of 0.24 mm and vacuum between the plates.

(2 marks)

(c) Calculate the equivalent capacitance in the circuit as shown in **Figure Q4(c).**

(9 marks)

(d) i) Define electric current and electric power.

(2 marks)

ii) A copper wire has a length of 150 m and a diameter of 1.00 mm. If the wire is connected to a 1.5 V battery, calculate the current flows through the wire. ($\rho_{Cooper} = 1.72 \times 10^{-8}$ Ω.m)

(6 marks)

Q5 (a) Give **TWO (2)** types of source of electromotive force, emf (ε).

(2 marks)

(b) A 9.0 V battery whose internal resistance r is 0.5 Ω is connected in the circuit shown in **Figure Q5 (b).**

i) Find the equivalent resistance for external loaded.

(8 marks)

ii) Calculate current is drawn from the battery.

(3 marks)

iii) Determine the terminal voltage of a battery.

(2 marks)

(c) State Kirchhoff's Current Law and Kirchhoff's Voltage Law.

(2 marks)

(d) Find the currents in the circuit shown in **Figure Q5 (d).**

(8 marks)

-END OF QUESTIONS -

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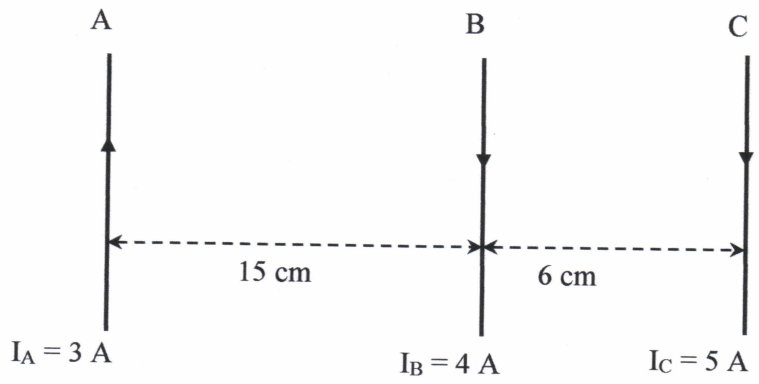

Figure Q1 (c)

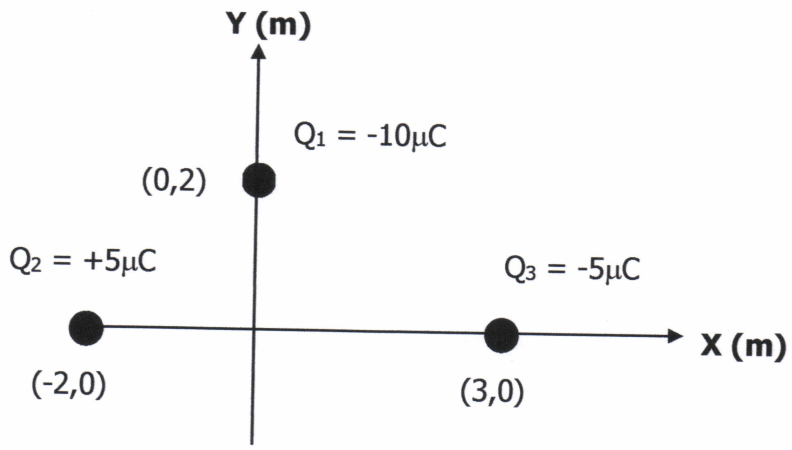

Figure Q3 (b)

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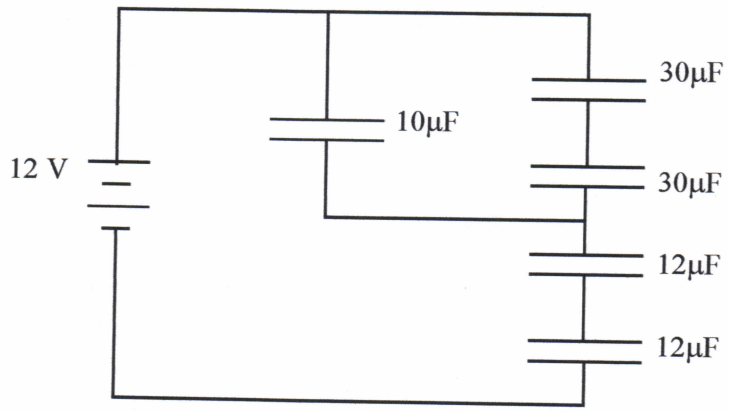

Figure Q4(c)

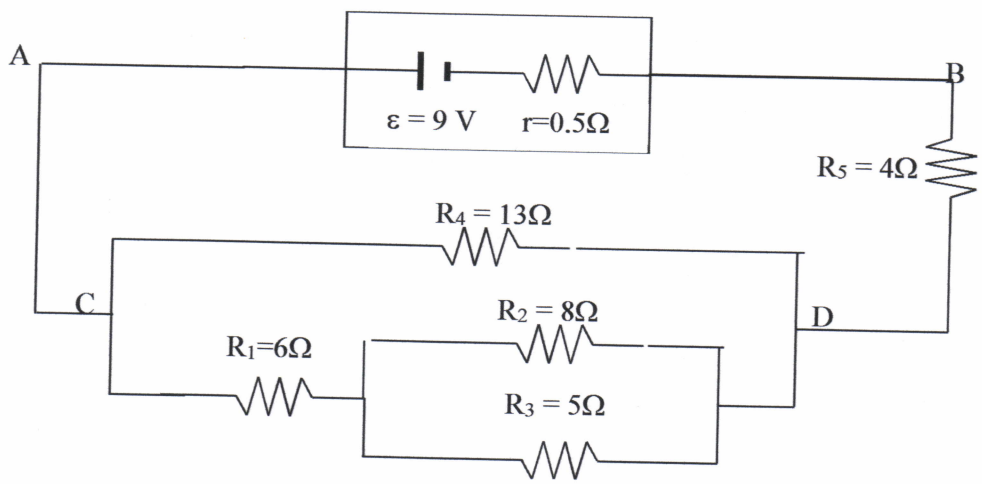

Figure Q5 (b)

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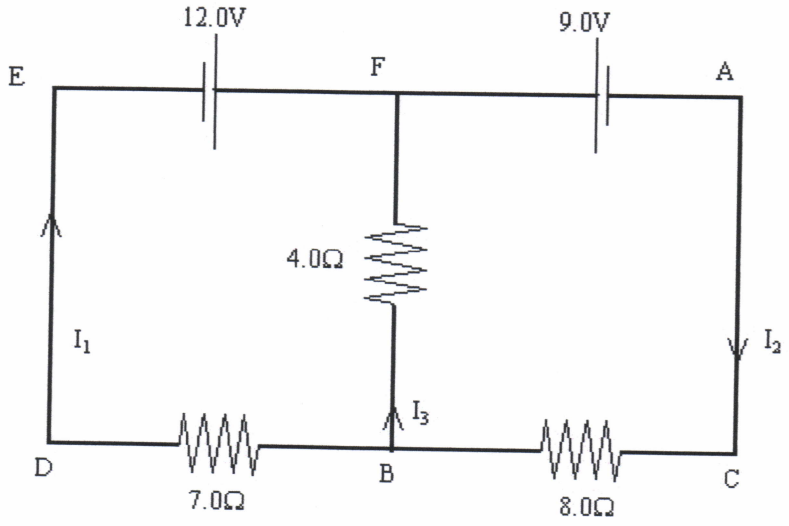

Figure Q5 (d)

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FORMULA

$E = hf$	$V = IR$	$n = \frac{N}{L}$	$F = \frac{\mu_0}{2\pi}(\frac{I_1 I_2}{d})l$
$A = \pi r^2$	$U = mgh$	$\Delta K = -\Delta U$	$F = \frac{\mu_0}{2\pi}(\frac{I_1}{d})l$
$\phi = hf_o$	$L = mvr = \frac{nh}{2\pi}$	$W_n = \Delta K$	$F = Bqv \sin\theta$
$K = eV_s$	$R = \sqrt{R_x^2 + R_y^2}$	$W = F\Delta x$	$\varepsilon = Blv \sin\theta$
$hf = K_{max} + \phi$	$E = \frac{F}{q}$	$W = q\Delta V$	$B = \mu_o nI$
$LP = m \cdot v$	$J = \frac{I}{A}\theta$	$q = ne$	$\Delta\Phi = \Phi_2 - \Phi_1$
$K = \frac{ke^2}{2r}$	$\frac{V_s}{V_p} = \frac{N_s}{N_p}$	$B = \frac{\mu_o I}{2\pi d}$	$E = \frac{q}{4\pi\varepsilon_o (r)^2}$
$E = \frac{kQ}{d^2}$	$C = \frac{\varepsilon_o A}{d}$	$K = \frac{1}{2}mv^2$	$f_o = \frac{\phi}{h} = \frac{hc}{h\lambda}$
$F = \frac{kq_1 q_2}{d^2}$	$\varepsilon = -N\frac{d\Phi}{dt}$	$v = \frac{BI}{neA}$	$e = -1.6x10^{-19}\ C$
$P = I^2 R$	$\varepsilon = -L\frac{dI}{dt}$	$E = \frac{\sigma}{\varepsilon}$	$\Phi = NBA \cos\theta$
$F = mv^2$	$\phi = \frac{hf_0}{e}$	$k = \frac{1}{4\pi\varepsilon_0}$	$h = 6.63\ x\ 10^{-34}\ Js$
$v = \frac{L}{t}$	$v = \frac{LI}{ne}$	$v = \frac{I}{neA}$	$\varepsilon = BAN\omega \sin\omega t$
$F = \frac{ke^2}{r}$	$C = \frac{\varepsilon_r \varepsilon_o A}{d}$	$\Phi = BA$	$c = 3.0\ X\ 10^8\ ms^{-1}$
$I = \frac{Q}{t}$	$U = -\frac{ke^2}{r}$	$C = \frac{Q}{V}$	$\mu_o = 4\pi\ x10^{-7} Tm$

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LIST OF CONSTANT

1. Gravity acceleration, $g = 9.81$ m/s^2
2. Rydberg constant, R = 1.097 x 10^7 m$^{-1.}$
3. Permeability of free space, $\mu_o = 4\pi \, x \, 10^{-7} Nm^{-1}$
4. Planck constant, $h = 6.63 \, x \, 10^{-34} Js$
5. Speed of light in air, $c = 3$ x 10^8 m/s
6. Charge of electron, $e = 1.602 \, x \, 10^{-19} C$
7. Permittivity of free space, $\varepsilon_o = 8.854 \, x \, 10^{-12} (Nm)^{-2} C^2$
8. Coulomb constant, $k = 9 \, x \, 10^9 Nm^2 C^{-2}$
9. Resistivity of cooper, $\rho_{cooper} = 1.67$ x 10^{-8} Ωm
10. Mass of electron, $e = 9.1 \, x \, 10^{-31} kg$
11. Mass of proton, $p = 1.673 \, x \, 10^{-27} kg$