

12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

FORENAME(S): DANIEL
WILLIAM

1	Student Number	118511
2	Title of Examination Paper	Electrical Technology
3	Module Code	PDSE 4021
4	Date and Time of Examination	16 May 2018 16:00
5	Examination Venue	Pemb's College
6	Seat Number	1
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
1	19
3	15
4	11
=	45
=	75%
Office Use	

2nd mark
/ GDP

(Gweler yr ochr arall am y fersiwn Cymraeg)



Prysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

12 Tuden

1. Rhwch yr holl wybodaeth y gofynnir amdani yn y blychau isod.
2. Rhwch eich enw yn y lle a ddarparwyd ar y dde, plygwch ef a'i selio i lawr (gan ddefnyddio'r label a ddarparwyd) i guddio'ch enw.

CYFENN:

Llenwch, plygwh a selwch
(gweler nodyn 2 isod)

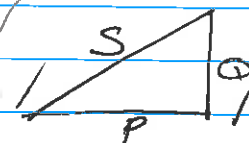
3. Rhaid i'r atebion fod mewn llawysgriflen ddarlennadwy. Gall yr Arholwyr naill ai anwybyddu sgrïpt annarllennadwy, neu drefnu iddi gael ei theipio a chael yr ymgaisydd i dalu.
4. Ysgrifennwch eich atebion mewn inc.
5. Dechreuwch bob ateb ar dudalen newydd. Gwnewch unrhyw fras nodiadau yn y llyfr atebion a thynnu llinell drwyddynt.
6. Ni ddylid rhwgo unrhyw ran o'r llyfr hwn, rhaid ei gyflwyno yn gyfan.
7. Os defnyddir mwy nag un llyfr, rhwymwch hwy gyda'i gilydd gan ddefnyddio'r tagiau sydd ar gael oddi wrth y gwylwtr/gwylwyr.
8. Rhaid dychwelyd pob llyfr. Ni chaniateir mynd â llyfrau atebion, wedi eu defnyddio neu heb eu defnyddio, allan o'r lleoliad arholi o dan unrhyw amgylchiadau.

[illegible]

(See the other side for English version)

1)

a Apparent power = VI (VA) ✓
 Real power = VI cos ϕ (W) ✓
 Reactive power = VI sin ϕ (VAR) ✓



b)

SA 50Hz 240V PF 0.7

$$\cos^{-1} 0.7 = 45.57$$

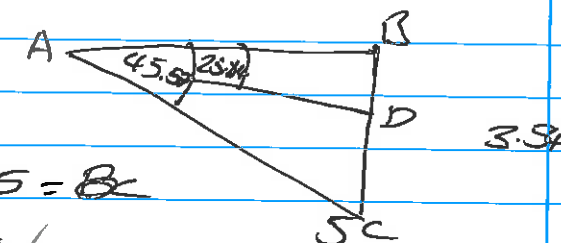
i Ap = 240 x 5 = 1200 VA

ii Real = 240 x 5 x 0.7 = 840 (W)

iii Reactive = 240 x 5 x sin 45.57 = 856.93 VAR

c)

$$\cos^{-1} 0.9 = 25.84$$



BC = 50H = sin 45 x 5 = 3.54A ✓
 $BC = 3.54A$ ✓

$$\cos 45 \times 5 = AB$$

$$AB = 3.54A$$

$$W = PV$$

$$X_C = \frac{1}{2\pi fC}$$

$$X_C = \frac{V}{I}$$

BD = Tan 25.84 x 3.54 = 1.71A ✓

DC = 3.54 - 1.71 = 1.83A ✓

$$S = \sqrt{3.54^2 + 1.83^2}$$

$$AB = 3$$

$X_C = \frac{240}{1.83} = 131.15 \Omega$ ✓

$C = \frac{1}{2\pi f X_C} = 24.27 \mu F$ ✓

2a frequency is amount of waveforms that pass
in 1 second, measured in Hz

periodic time is the time for 1 complete
cycle of a wave. is the reciprocal of
 f , $f = \frac{1}{T}$

b.

✓

3a) Kirchhoff's current law is defined by the current exiting a junction is equal to the current ~~exiting~~ entering.

Kirchhoff's voltage law states the the sum of voltages in a closed loop are equal to 0.

$$b) \quad R_3 // R_4 = 2k\Omega \quad \frac{3k\Omega \cdot 6k\Omega}{3k\Omega + 6k\Omega}$$

$$R_3 R_4 + R_2 = 3k\Omega$$

$$R_{234} // R_1 = \frac{3k\Omega \cdot 3k\Omega}{3k\Omega + 3k\Omega} = 1.5k\Omega = R$$

$$\frac{V}{I \cdot R} \quad I_T = \frac{15}{1.5k} = 10mA \quad \checkmark$$

$$I_1 = \frac{15}{3000} = 5mA$$

$$I_2 = 10mA - 5mA = 5mA \quad \checkmark$$

$$I_3 = \frac{5mA \times 6k}{3k + 6k} = 3.33mA \quad \checkmark$$

$$I_4 = \frac{5mA \times 3k}{3k + 6k} = 1.67mA$$

$$P = IV = 10mA \times 1.5 = 0.15W$$

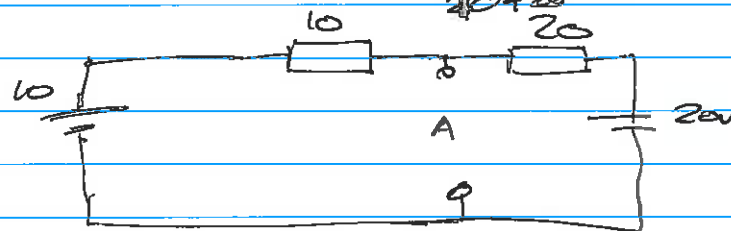
$$\frac{P = I^2 R}{R_1 + R_2}$$

(12) /
50P

d)

$$U = \frac{B_1 - B_2}{R_1 + R_3} = \frac{10 - 20}{20 + 10} = -\frac{10}{30} = -\frac{1}{3} \text{ V}$$

$$\frac{10 - 20}{20 + 10} = -\frac{1}{3} \text{ V}$$



$$I_T = \frac{9.5}{6.6} = 1.44 \text{ A}$$

$$R_T = 10 // 20 = \frac{10 \times 20}{10 + 20} = 6.6 \Omega$$

$$I_1 = \frac{B_1 - I_T \times R_1}{10 + 20}$$

2

$$U = \frac{B_2 - B_1}{R_1 + R_3} = \frac{20 - 10}{30} = 0.3 \text{ V}$$

$$I_T = \frac{0.3}{6.6} = 45 \text{ mA}$$

$$I_1 = \frac{10 - (45 \text{ mA} \times 10)}{30} = 318 \text{ mA}$$

6.63 mA

(3)

$$3 + 12 = 15 \text{ mA}$$

SDF

4. EMF is the measured charge ~~acting~~ acting on a circuit

1

ii) $\frac{20}{4} = 5 \text{ W}$

iii) $5 \times 10 = 50 \text{ Watts}$

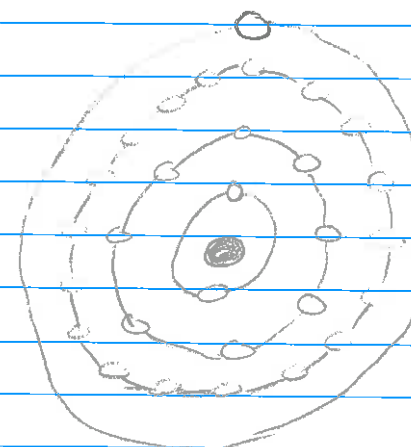
b. electric current is the flow of electrons ~~the~~ around a circuit, current is measured in Amperes.

1

ii) $4 \times 1 = 4$ $\frac{4}{1.63 \times 10^{-19}} = 2.495 \times 10^9$ electrons

4

c).



O = electron.

● = nucleus.

2

As the Copper atom has a loosely bonded free electron in its outer shell. That electron can be easily transferred to another atom with little supplied energy. This movement of electrons is the low electrical charge.

is transferred. As little energy is required to remove that electron, this is what makes copper a good conductor.

~~Therefore~~ the loosely bonded electron will move towards the positively charged atoms as electrons are negatively charged

3

(11)

SDP