

# Exam

*by* Morgan Jones

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|----------------|------------------------------------------------------|-----------------|-----|
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**LOCATION: SWANSEA**

**LLEOLIAD: ABERTAWE**

**LEVEL 4**

**LEFEL 4**

**EXAMINATION PERIOD**  
**MAY 2020**

**CYFNOD ARHOLIADAU**  
**MAI 2020**

**MODULE CODE: ACDB4002 & ACDA4006**  
**Electrical and Electronic Principles**

**TIME: 2 HOURS + 30 MINS (ADDITIONAL NEEDS) AND 30 MINS TO  
COLLATE ANSWERS**

**ALL QUESTIONS ANSWERED EXCEPT SECTION Q4C, Q4E AND Q5**



## EEP Exam

Q1

a) Period of Wave form

$$4 \times 10 \text{ ms/div} = 40 \text{ ms}$$

b) determine frequency

$$F = 1/T = 1/0.04 = 25 \text{ Hz}$$

c) Peak to Peak amplitude

$$V_{PK-PK} = 4 \text{ div} \times 2 \text{ V} = 8 \text{ V}$$

d) RMS value of wave form

$$V_{RMS} = V_{PK} \times 0.7071 = 4 \times 0.7071 = 2.83 \text{ V}$$

# EEP EXAM

Q2

a) calculate  $V_c$

$$\tau = RC$$

$$\tau = 100 \times 10^3 \times 20 \times 10^{-6} = 2 \text{ seconds}$$

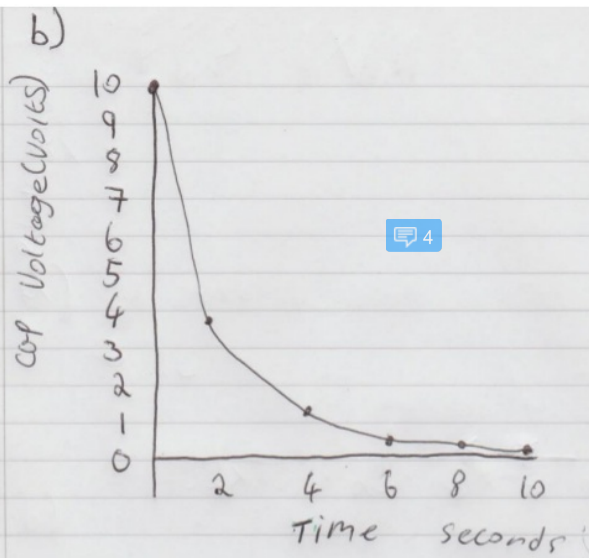
$$V_c = V_s(e^{-t/\tau})$$

$$V_c = 10(e^{-4/2})$$

$$= 1.353V$$

b) Graph and

| $t(\text{seconds})$ | $V_c$ Volts | $(V = V_s e^{-t/RC})$ |
|---------------------|-------------|-----------------------|
| 0                   | 10          |                       |
| 2                   | 3.678       |                       |
| 4                   | 1.353       |                       |
| 6                   | 0.497       |                       |
| 8                   | 0.183       |                       |
| 10                  | 0.067       |                       |



c) stored energy within a capacitor

$$E = \frac{1}{2} CV^2$$

$$E = \frac{1}{2} \times 20 \times 10^{-6} \times 10^2 = 100 \times 10^{-5} \text{ J}$$

d) time taken to reach 0.25mJ

$$V = \sqrt{\frac{E}{\frac{1}{2}C}} = \sqrt{\frac{0.25 \times 10^{-3}}{\frac{1}{2} \times 20 \times 10^{-6}}} = 5V$$

$$V_C = V_S (e^{-t/\tau})$$

$$-\ln(V_C/V_S) \times \tau = t$$

$$-\ln(5/10) \times 2 = 1.39 \text{ seconds}$$

3) 7 basic logic functions,  
Boolean equations, truth tables and  
logic symbols

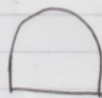
~~Functions~~

~~AND OR XOR~~

Functions

AND, OR, XOR, NOT, NAND, NOR, and Xor

symbols



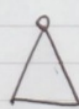
AND



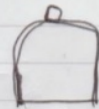
OR



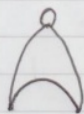
XOR



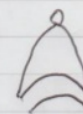
NOT



~~NAND~~  
NAND



NOR



XNOR

3)

Truth tables

Input = A + B  
Output = Z

NOT

| A | Z |
|---|---|
| 0 | 1 |
| 1 | 0 |

AND

| A | B | Z |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 1 |

OR

| A | B | Z |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 1 |

XOR

| A | B | Z |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 0 |

NAND

| A | B | Z |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 0 |

NOR

| A | B | Z |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 0 |

XNOR

| A | B | Z |
|---|---|---|
| 0 | 0 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 1 |

3)

Boolean

Expressions

$$\text{AND} = A \cdot B = Z$$

$$\text{OR} = A + B = Z$$

$$\text{XOR} = A \oplus B = Z$$

$$\text{NOT} = \bar{A} = Z$$

$$\text{NAND} = \overline{A \cdot B} = Z$$

$$\text{NOR} = \overline{A + B} = Z$$

$$\text{XNOR} = \overline{A \oplus B} = Z$$

4)

a) Total resistance

$$R_A = R_1 + R_2 = 100 + 310 = 410\Omega$$

$$R_B = R_5 + R_7 = 130 + 470 = 600\Omega$$

$$R_C = R_3 + R_6 + R_4 = 270 + 750$$

$$270 + 750 = 1020$$

$$R_C = 1/330 + 1/1020 = 249.3\Omega$$

$$R_T = R_A + R_B + R_C = 410 + 600 + 249.3$$

9

$$R_T = 1279.3\Omega$$

b) Total current

$$I = V/R$$

$$I = 15/1279.3 = 11.7\text{mA}$$

10

D) Total power from battery

$$P = IV = 11.7 \times 10^{-3} \times 15 = 175.5 \text{ mW}$$

11

8)  $R_4$  replaced by wire

Ans

$$R_T = R_A + R_B + R_C$$

$$R_T = 410 + 620 + 1020 = 2050 \Omega$$

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# Exam

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## GRADEMARK REPORT

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FINAL GRADE

GENERAL COMMENTS

**Instructor**

**52**/100

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PAGE 1

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### Comment 1

Total Marks = 26

Marks Available = 50

$26/50 = 52\%$

PAGE 2

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### Comment 2

Question 1

a) 1 Mark

b) 1 Mark

c) 1 Mark

d) 2 Marks

Q1 total 5 Marks

PAGE 3

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### Comment 3

Question 2

a) 1 Mark (For correct time constant)



#### Comment 4

Q2 b) 3 Marks

1 each for:

- appropriate labels
- units
- scales

Graph should show CHARGING not discharging - read the question.



#### Comment 5

q2 c) 3 Marks



#### Comment 6

Q2 d) 4 Marks

Incorrect formula used - should be charging equation not discharging equation. By some fluke the answer is the same using either equation with these values.



#### Comment 7

Question 2 total = 11 Marks



#### Comment 8

Q3 - 5 Marks

Your gate symbols show no inputs or outputs



### **Comment 9**

Q4 a) 1 Mark

Incorrect resistor grouping.  $R_T = 667.173 \text{ Ohms}$



### **Comment 10**

Q4 b) 2 Marks



### **Comment 11**

Q4

d) 2 Marks

e) 0 Marks



### **Comment 12**

Question 4 total = 5 Marks