CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

25 MAY 2017 (p.m.)

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TEST CODE | 0 | 1 | 3 | 7 | 0 | 0 | 2 | 0 |

SUBJECT INDUSTRIAL TECHNOLOGY
OPTION A – ELECTRICAL AND ELECTRONIC TECHNOLOGY – Paper 02

PROFICIENCY TECHNICAL

REGISTRATION NUMBER | | | | | | | | | | |

SCHOOL/CENTRE NUMBER					

NAME OF SCHOOL/CENTRE

CANDIDATE'S FULL NAME (FIRST, MIDDLE, LAST)

DATE OF BIRTH | D | D | M | M | Y | Y | Y | Y |

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FORM TP 2017076

TEST CODE 01370020

MAY/JUNE 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

INDUSTRIAL TECHNOLOGY

OPTION A – ELECTRICAL AND ELECTRONIC TECHNOLOGY

Paper 02 – Technical Proficiency

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of FIVE compulsory questions.
2. Use sketches where necessary to support your answers.
3. Write your answers in the spaces provided in this booklet.
4. Do NOT write in the margins.
5. You may use a silent, non-programmable calculator to answer questions.
6. This paper contains metric dimensions only. You should work your answers in the metric system.
7. You are advised to take some time to read through the paper and plan your answers.
8. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
9. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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1. (a) (i) State TWO effects of an electric current.

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(2 marks)

(ii) Describe the following materials and give an example of EACH.

- Conductor

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(2 marks)

- Insulator

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(2 marks)

(b) Figure 1 shows the circuit diagram of three resistors connected in series to a 12 V d.c. supply.

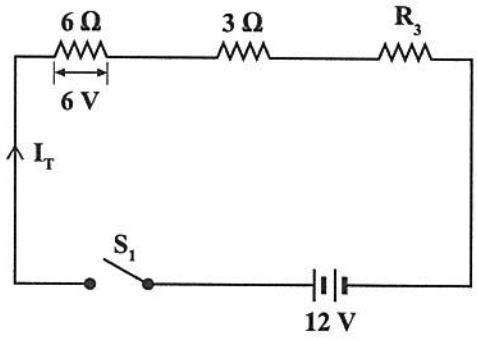


Figure 1. Three resistors connected in series

Calculate the

(i) total current flowing in the circuit when switch S_1 is closed

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(2 marks)

(ii) total resistance of the series resistors

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(2 marks)

(iii) the resistance of resistor R_3.

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(2 marks)

(c) Draw a schematic diagram to control an electric lamp in a stairway by a switch on the top and another switch on the bottom of the stairway.

(6 marks)

Total 18 marks

2. (a) Draw the electrical/electronic symbols for EACH of the following components.

(i) Fuse	(ii) Diode	(iii) Fluorescent lamp
(iv) Inverter	(v) RS flip flop	(vi) Earth

(6 marks)

(b) Figure 2 shows a schematic diagram of a filament lamp controlled by a single-pole switch connected to an alternating current supply.

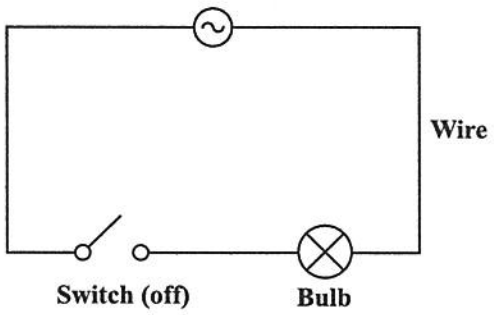


Figure 2. Schematic diagram

Draw a wiring diagram for the schematic diagram in Figure 2 to construct the filament lamp circuit using twin core flat PVC cable with earth conductor and a four-terminal all-insulated joint box.

(6 marks)

(c) Figure 3 shows a block diagram of a personal computer.

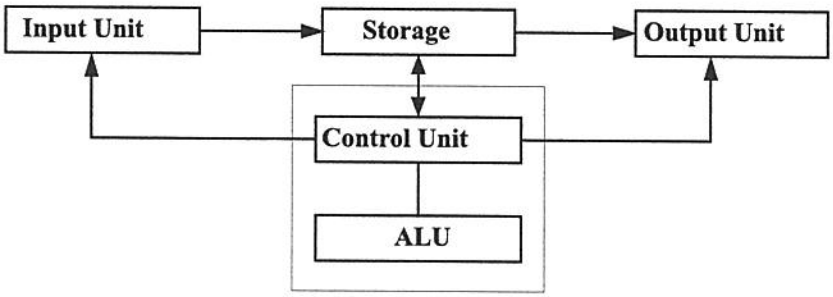


Figure 3. Block diagram of a personal computer

Briefly outline the function of any TWO of the blocks in the block diagram.

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(6 marks)

Total 18 marks

3. (a) (i) List the names of THREE types of single-phase AC electrical motors used to construct electrical and electronic appliances and equipment.

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(3 marks)

(ii) List THREE types of losses that are produced in the operation of an alternating current transformer.

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(3 marks)

(b) A 120 V to 12 V bell transformer operates at 100% efficiency and supplies a 12 V, 6 W alarm bell. The transformer is wound with 400 turns of the primary winding. Calculate the

(i) secondary current

(3 marks)

(ii) primary current.

(3 marks)

(c) Figure 4 shows the schematic drawing of a three-phase direct on line motor starter.

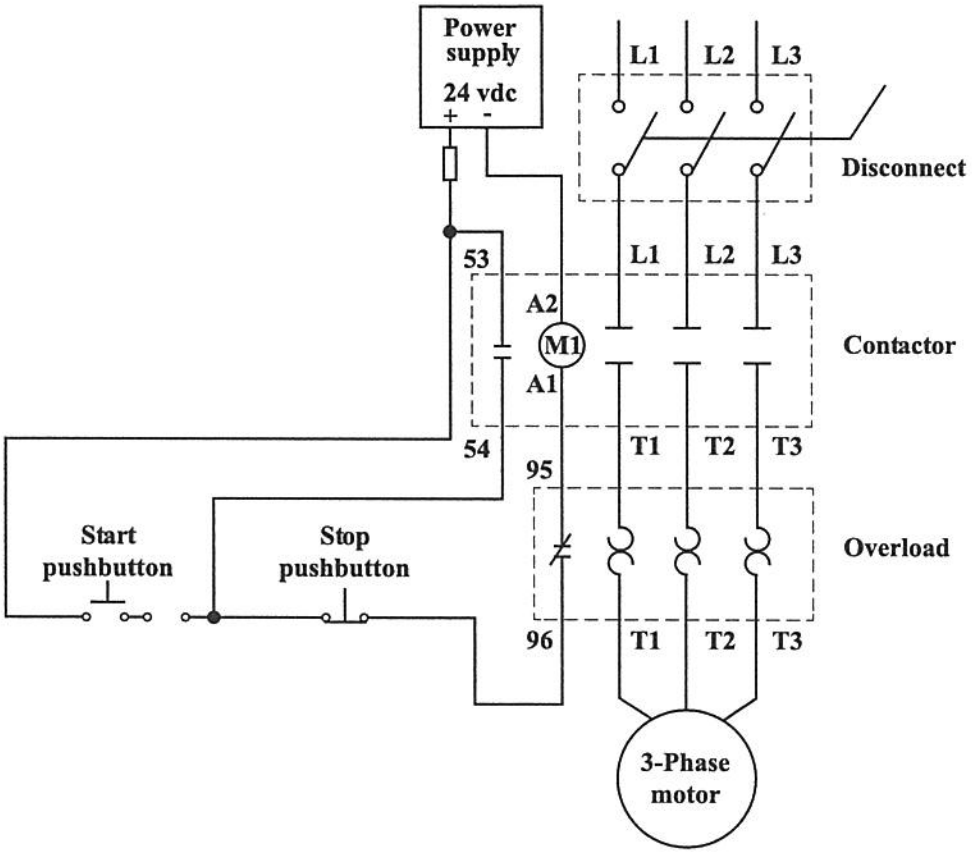


Figure 4. Direct on line motor starter

(i) Outline the circuit relationships that are required to connect remote stop and start pushbuttons to the existing start and stop pushbuttons on the motor starter.

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(3 marks)

GO ON TO THE NEXT PAGE

(ii) Outline THREE changes that can be made in the connections of a three-phase AC motor to produce a change in the direction of rotation of the armature of the machine.

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(3 marks)

Total 18 marks

4. (a) Define EACH of the following terms:

(i) Fusing current

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(ii) Fusing factor

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(iii) Illumination

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(iv) Luminous flux

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(v) Primary cell

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(vi) Secondary cell

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(6 marks)

(b) A 3000 cd light source is suspended 4 m above a plain surface. Calculate the illumination

(i) on the plain surface directly below the lamp

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(2 marks)

(ii) on the plain surface 4 m from the centre of the lamp.

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(4 marks)

(c) With the aid of a diagram, outline how a polarity test can be conducted on a completed electrical installation before it is connected to an AC supply system.

(6 marks)

Total 18 marks

5. (a) (i) State a function of EACH of the following semiconductor devices:

- Transistor

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- Thermistor

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(2 marks)

(ii) Name TWO semiconductor materials.

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(2 marks)

(iii) Sketch the sinusoidal waveform for EACH of the following changing currents:

- Analogue

- Digital

(2 marks)

(b) Figure 5 shows the circuit diagram of a single stage transistor amplifier.

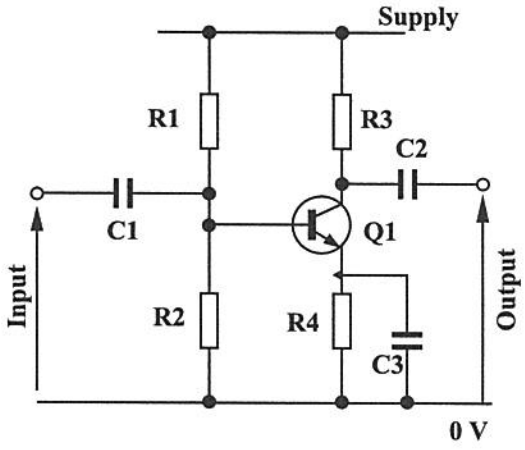


Figure 5. Transistor amplifier circuit diagram

Explain the functions of EACH of the following pairs of components in the operation of the transistor amplifier:

(i) R1 and R2

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(ii) C1 and C2

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(iii) R4 and C3

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(6 marks)



(c) Figure 6 shows the schematic drawing of a bridge rectifier circuit.

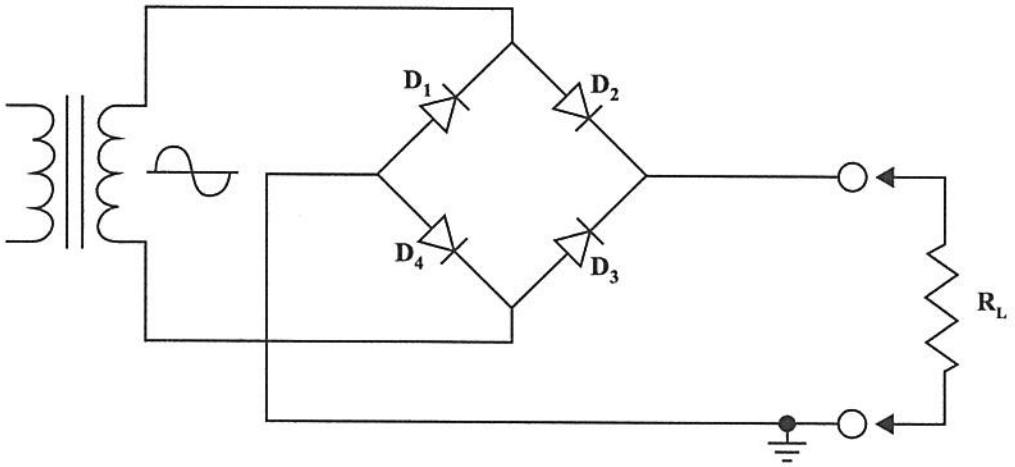


Figure 6. Bridge rectifier

(i) Outline the operation of the rectifier circuit when it supplies d.c. to the load resistor, R_L.

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(4 marks)

(ii) Briefly describe the change in the operation of the bridge rectifier circuit when one of the four diodes is open-circuited.

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(2 marks)

Total 18 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. ☐

EXTRA SPACE

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Question No. [ ]

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1. **Fill in all the information requested clearly in capital letters.**

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SUBJECT: INDUSTRIAL TECHNOLOGY
OPTION A – ELECTRICAL AND ELECTRONIC TECHNOLOGY – Paper 02

PROFICIENCY: TECHNICAL

REGISTRATION NUMBER: | | | | | | | | | | |

FULL NAME: _____
(BLOCK LETTERS)

Signature: _____

Date: _____

2. **Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.**

3. **Keep it in a safe place until you have received your results.**

INSTRUCTION TO SUPERVISOR/INVIGILATOR:

Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

Signature: _____
Supervisor/Invigilator

Date: _____



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