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# ELECTRICAL INSTALLATION

PAPER 3 PRACTICAL EXAMINATION 4130/PRA/3a  
ASSIGNMENT 1

**15 APRIL – 8 MAY 2024**

**Additional materials:**  
**Electrical tools/supplies**

**1 hour plus**  
**30 minutes for preparation**

## MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

### INSTRUCTIONS TO CANDIDATES

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Answer the questions as they relate to your circuits.

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Measuring instruments and electronic calculators are allowed.



This question paper consists of 4 printed pages.

**Table of Allowable Excerpt NEC 2011**

**Ampacities of Insulated Conductors with Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried)**

| Size AWG or<br>kcmil | Temperature Rating of Conductor [See Table 310.104(A).] |                                                             |                                                                                                                                                           |                                    |                                                      |                                                                                                                           | Size AWG or<br>kcmil |
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|                      | Types TW,<br>UF                                         | Types RHW,<br>THHW, THW,<br>THWN, XHHW,<br>XHWN,<br>USE, ZW | Types TBS, SA, SIS,<br>FEP, FEPB, MI, PFA,<br>RHH, RHW-2, THHN,<br>THHW, THW-2,<br>THWN-2, USE-2, XHH,<br>XHHW, XHHW-2,<br>XHWN, XHWN-2,<br>XHHN, Z, ZW-2 | Types TW,<br>UF                    | Types RHW,<br>THHW, THW,<br>THWN, XHHW,<br>XHWN, USE | Types TBS, SA, SIS,<br>THHN, THHW,<br>THW-2, THWN-2,<br>RHH, RHW-2, USE-2,<br>XHH, XHHW,<br>XHHW-2, XHWN,<br>XHWN-2, XHHN |                      |
| COPPER               |                                                         |                                                             |                                                                                                                                                           | ALUMINIUM OR COPPER-CLAD ALUMINIUM |                                                      |                                                                                                                           |                      |
| 18*                  | —                                                       | —                                                           | 14                                                                                                                                                        | —                                  | —                                                    | —                                                                                                                         | —                    |
| 16*                  | —                                                       | —                                                           | 18                                                                                                                                                        | —                                  | —                                                    | —                                                                                                                         | —                    |
| 14*                  | 15                                                      | 20                                                          | 25                                                                                                                                                        | —                                  | —                                                    | —                                                                                                                         | —                    |
| 12*                  | 20                                                      | 25                                                          | 30                                                                                                                                                        | 15                                 | 20                                                   | 25                                                                                                                        | 12*                  |
| 10*                  | 30                                                      | 35                                                          | 40                                                                                                                                                        | 25                                 | 30                                                   | 35                                                                                                                        | 10*                  |
| 8                    | 40                                                      | 50                                                          | 55                                                                                                                                                        | 35                                 | 40                                                   | 45                                                                                                                        | 8                    |
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| 4                    | 70                                                      | 85                                                          | 95                                                                                                                                                        | 55                                 | 65                                                   | 75                                                                                                                        | 4                    |
| 3                    | 85                                                      | 100                                                         | 115                                                                                                                                                       | 65                                 | 75                                                   | 85                                                                                                                        | 3                    |
| 2                    | 95                                                      | 115                                                         | 130                                                                                                                                                       | 75                                 | 90                                                   | 100                                                                                                                       | 2                    |
| 1                    | 110                                                     | 130                                                         | 145                                                                                                                                                       | 85                                 | 100                                                  | 115                                                                                                                       | 1                    |
| 1/0                  | 125                                                     | 150                                                         | 170                                                                                                                                                       | 100                                | 120                                                  | 135                                                                                                                       | 1/0                  |
| 2/0                  | 145                                                     | 175                                                         | 195                                                                                                                                                       | 115                                | 135                                                  | 150                                                                                                                       | 2/0                  |
| 3/0                  | 165                                                     | 200                                                         | 225                                                                                                                                                       | 130                                | 155                                                  | 175                                                                                                                       | 3/0                  |
| 4/0                  | 195                                                     | 230                                                         | 260                                                                                                                                                       | 150                                | 180                                                  | 205                                                                                                                       | 4/0                  |
| 250                  | 215                                                     | 255                                                         | 290                                                                                                                                                       | 170                                | 205                                                  | 230                                                                                                                       | 250                  |
| 300                  | 240                                                     | 285                                                         | 320                                                                                                                                                       | 195                                | 230                                                  | 260                                                                                                                       | 300                  |
| 350                  | 260                                                     | 310                                                         | 350                                                                                                                                                       | 210                                | 250                                                  | 280                                                                                                                       | 350                  |
| 400                  | 280                                                     | 335                                                         | 380                                                                                                                                                       | 225                                | 270                                                  | 305                                                                                                                       | 400                  |

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*Source from current Wiring Book*

For all circuits assume 75 °C temperature, please refer to table above where applicable.

**Grounding**

- A six-inch grounding wire should be affixed and allowed to hang on all devices or control units that should be grounded.
- Install a grounding wire in the appropriate place in the main switch.
- It is not necessary to run the grounding wire throughout the installation if the conduit run is EMT.



### ASSIGNMENT 1

On your wiring boards you are required to wire:

- A. a 100A, 125/250V 3-wire single phase overhead service for a residential installation with **TWO** circuits in the installation. [8]
- B. **Circuit I:** ONE 60A, 125/250V receptacle suitable for an electric range. [5]
- C. **Circuit II:** TWO 40W, 125V lamps each controlled from **ONE** location. [5]

### QUESTIONS

1. What size and type are the main service copper conductors?  
Size \_\_\_\_\_ [1]  
Type \_\_\_\_\_ [1]
2. What is the size and type of circuit breaker used in the main disconnect switch?  
Size \_\_\_\_\_ [1]  
Type \_\_\_\_\_ [1]

#### In Circuit I:

3. State the voltage that is applied across the heater element for the range circuit.  
\_\_\_\_\_ [1]
4. State the size and type of circuit breaker that is required to protect the circuit.  
Size \_\_\_\_\_ [1]  
Type \_\_\_\_\_ [1]

**In Circuit II:**

5. Calculate the total power used by the lamps when both are lit. [2]

Show all working.

6. Calculate the total current drawn when both lamps are lit. [2]

Show all working.



| School Number        | Candidate Number |
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# ELECTRICAL INSTALLATION

PAPER 3 PRACTICAL EXAMINATION 4130/PRA/3b  
ASSIGNMENT 2

**15 APRIL – 8 MAY 2024**

**Additional materials:**  
**Electrical tools/supplies**

**1 hour plus**  
**30 minutes for preparation**

## MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

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This question paper consists of 4 printed pages.

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| Size AWG or<br>kcmil | Temperature Rating of Conductor [See Table 310.104(A).] |                                                    |                                                                                                                                                            |                                    |                                                      |                                                                                                                           | Size AWG or<br>kcmil |
|----------------------|---------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|
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| COPPER               |                                                         |                                                    |                                                                                                                                                            | ALUMINIUM OR COPPER-CLAD ALUMINIUM |                                                      |                                                                                                                           |                      |
| 18*                  | —                                                       | —                                                  | 14                                                                                                                                                         | —                                  | —                                                    | —                                                                                                                         | —                    |
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*Source from current Wiring Book*

For all circuits assume 75 °C temperature, please refer to table above where applicable.

**Grounding**

- A six-inch grounding wire should be affixed and allowed to hang on all devices or control units that should be grounded.
- Install a grounding wire in the appropriate place in the main switch.
- It is not necessary to run the grounding wire throughout the installation if the conduit run is EMT.



### Assignment 2

On your wiring boards, you are required to wire **THREE** branch circuits in a residential installation.

- A.     **Circuit I:**       **ONE** 20A, 125V receptacle suitable for a space heater. [5]
- B.     **Circuit II:**     **THREE** 15A, 125V duplex receptacles, one switched and two live. [5]
- C.     **Circuit III:**    **ONE** 75W, 125V lamp controlled from **TWO** locations. [5]

### QUESTIONS

#### In Circuit I:

1.     What are the minimum size of copper conductors for this circuit?  
Size \_\_\_\_\_ [1]
2.     What size and type of circuit breaker are required to protect this circuit?  
Size \_\_\_\_\_ [1]  
Type \_\_\_\_\_ [1]

#### In Circuit II:

3.     What is the name of the switch used to control the duplex receptacle?  
\_\_\_\_\_ [1]
4.     Which colour conductors are usually connected to this switch?  
\_\_\_\_\_ [2]
5.     How many loads can be safely connected in this circuit?  
\_\_\_\_\_ [1]

**In Circuit III:**

6. Calculate the current drawn when the lamp is lit.

Show all working

[3]



| School Number        | Candidate Number |
|----------------------|------------------|
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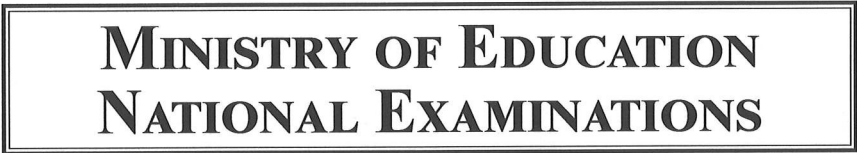
ELECTRICAL INSTALLATION

PAPER 3 PRACTICAL EXAMINATION 4130/PRA/3c  
ASSIGNMENT 3

15 APRIL – 8 MAY 2024

Additional materials:  
Electrical tools/supplies

1 hour plus  
30 minutes for preparation



BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

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*Adapted from Goodheart-Willcox Co, Inc.*

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**Grounding**

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### Assignment 3

On your wiring boards, you are required to wire **TWO** branch circuits in a residential installation.

**Circuit I:**        **ONE** bell controlled from **ONE** location and a buzzer controlled from another location. [5]

**Circuit II:**     **ONE** fluorescent light strip controlled with a photocell. [5]

### QUESTIONS

#### In Circuit I:

1.        State the output voltage on the transformer.

\_\_\_\_\_ [1]

2.        What size conductor is used for this circuit?

Size \_\_\_\_\_ [1]

3.        What type of switch is used for this circuit?

Type \_\_\_\_\_ [1]

#### In Circuit II:

4.        What is the colour code on the photo cell?

\_\_\_\_\_ [1]

5.        What is another name for the transformer found in the fluorescent light strip?

\_\_\_\_\_ [1]



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