higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T490**(E)**(A14)T

NATIONAL CERTIFICATE

MULTIDISCIPLINARY DRAWING OFFICE PRACTICE: ELECTRICAL DRAUGHTING

(8080625)

14 August 2019 (X-Paper)
09:00–13:00

REQUIREMENTS: Drawing sheets

Calculators, drawing instruments and computer-aided drawing software and/or drawing equipment may be used.

This question paper consists of 8 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MULTIDISCIPLINARY DRAWING OFFICE PRACTICE:
ELECTRICAL DRAUGHTING
TIME: 4 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.

2. Read ALL the questions carefully.

3. Number the answers according to the numbering system used in this question paper.

4. Answer ALL the questions (theory and drawings) on DRAWING SHEETS. NO separate ANSWER BOOK is required.

5. Marks will be allocated for:

   5.1 Balanced layout and size
   5.2 Correctness
   5.3 Lettering
   5.4 Line work and neatness

6. Work neatly.

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QUESTION 1: GENERAL THEORY

1.1 Give the conductor sizes (in mm^2) that are suitable for each of the following circuits or subcircuits in a small household electrical installation:

1.1.1 Main supply

1.1.2 Cooking appliance (stove)

1.1.3 Geyser

1.1.4 Socket outlets (power points)

1.1.5 Illumination (lights)

(5 × 1) (5)

1.2 Name THREE elements/materials that are good electrical conductors. (3)

1.3 A three-phase transformer has a maximum rating (S) of 500 kVA.

Calculate the maximum line current that should NOT be exceeded if the line voltage is 400 V.

Hint: $S = \sqrt{3} \times V_L \times I_L$ (3)

1.4 Briefly explain the term *stroboscopic effect*. (4)

1.5 Copy and complete the following table of electrical quantities and standard units.

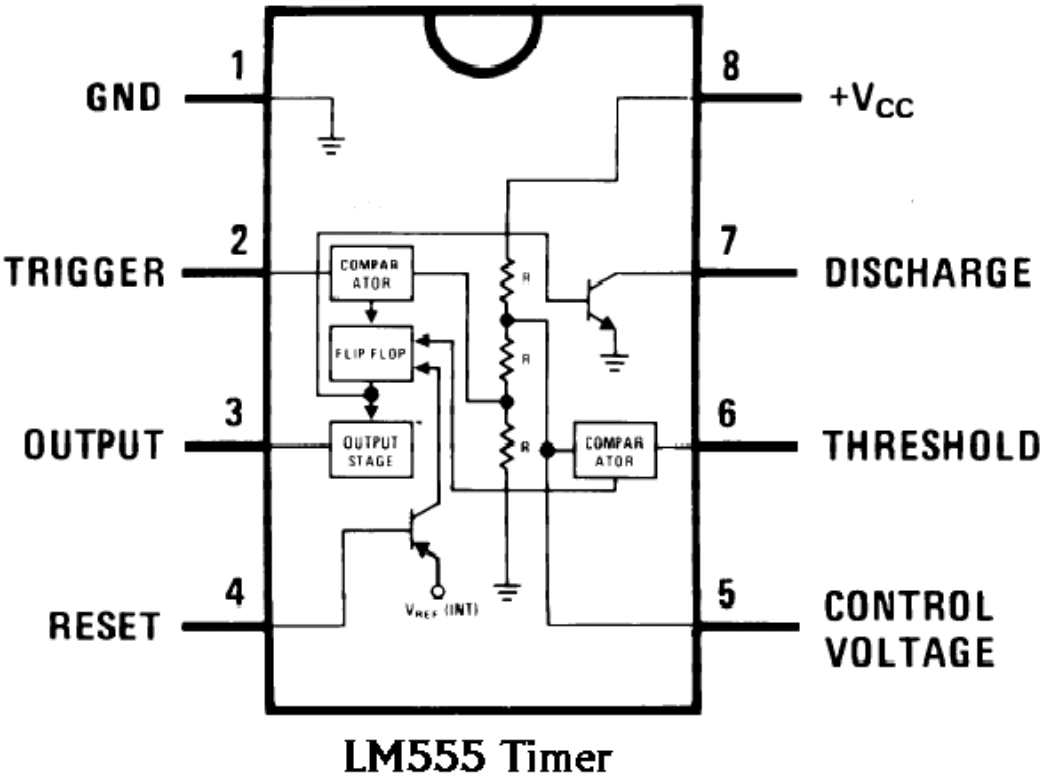
ELECTRICAL QUANTITY	STANDARD UNIT
1.5.1	Joule
1.5.2	Hertz
Reactance	1.5.3
Resistance	1.5.4
Charge	1.5.5

(5 × 1) (5)

[20]

QUESTION 2: GRAPHICAL SYMBOLS AND ELECTRONIC DIAGRAMS

2.1 FIGURE 1 shows a block diagram of a 555 integrated circuit.

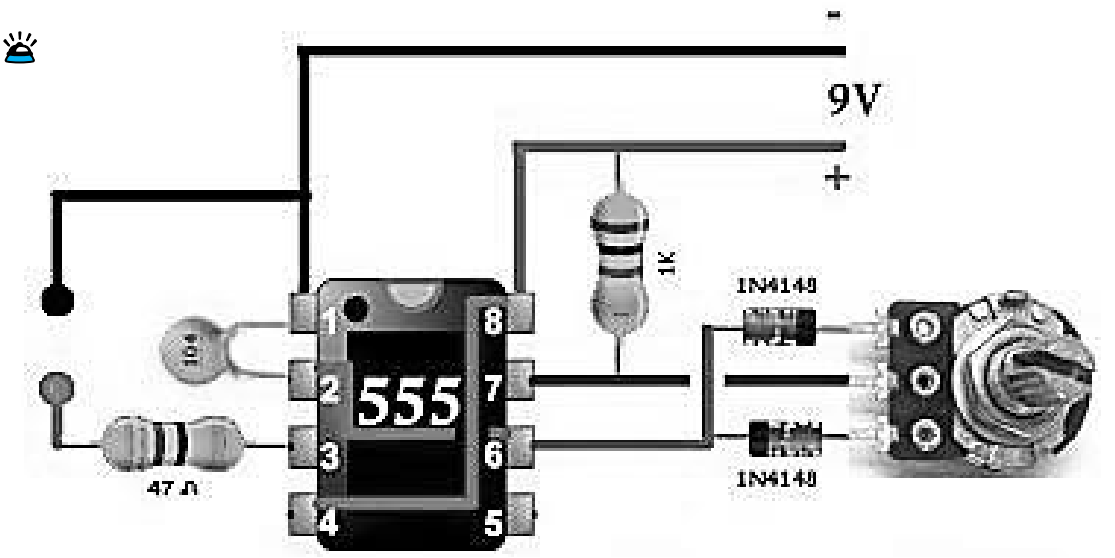


[Source: *http://www.vesselyn.com*]

FIGURE 1

Use the given diagram to draw a neat, labelled drawing with correct graphical symbols. Improve the layout where possible. (10)

2.2 FIGURE 2 represents a 555 – PWM circuit. The technician who designed and drew the given electrical diagram was not sure about the correct symbols for the capacitors (C1), resistors (R1; R2), variable resistor (R_{pot}), diodes (D1; D2) and the battery (BT1) of the PWM circuit and therefore took the initiative to draw it.



[Source: *www.youtube.com*]

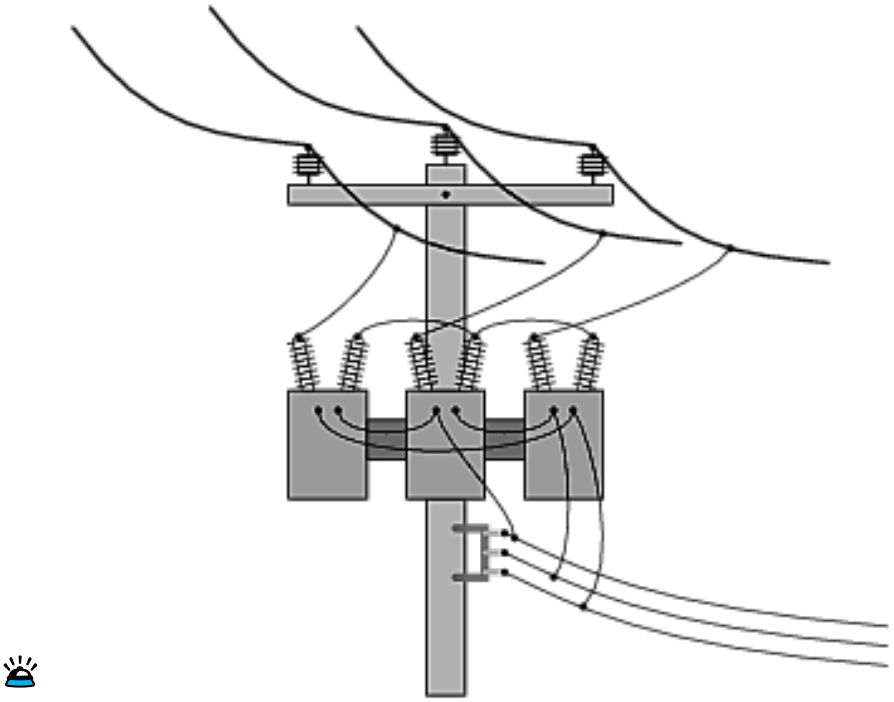
FIGURE 2

Use the given diagram to draw a neat, labelled drawing with correct graphical symbols that will be ready for reproduction. Improve the layout where possible. (10)

[20]

QUESTION 3: GENERATION AND DISTRIBUTION OF ELECTRICITY

FIGURE 3 shows the components of a delta-star pole-mounted transformer.



[Source: *https://www.allaboutcircuits.com/*]

FIGURE 3

Draw a fully labelled block diagram of this system.

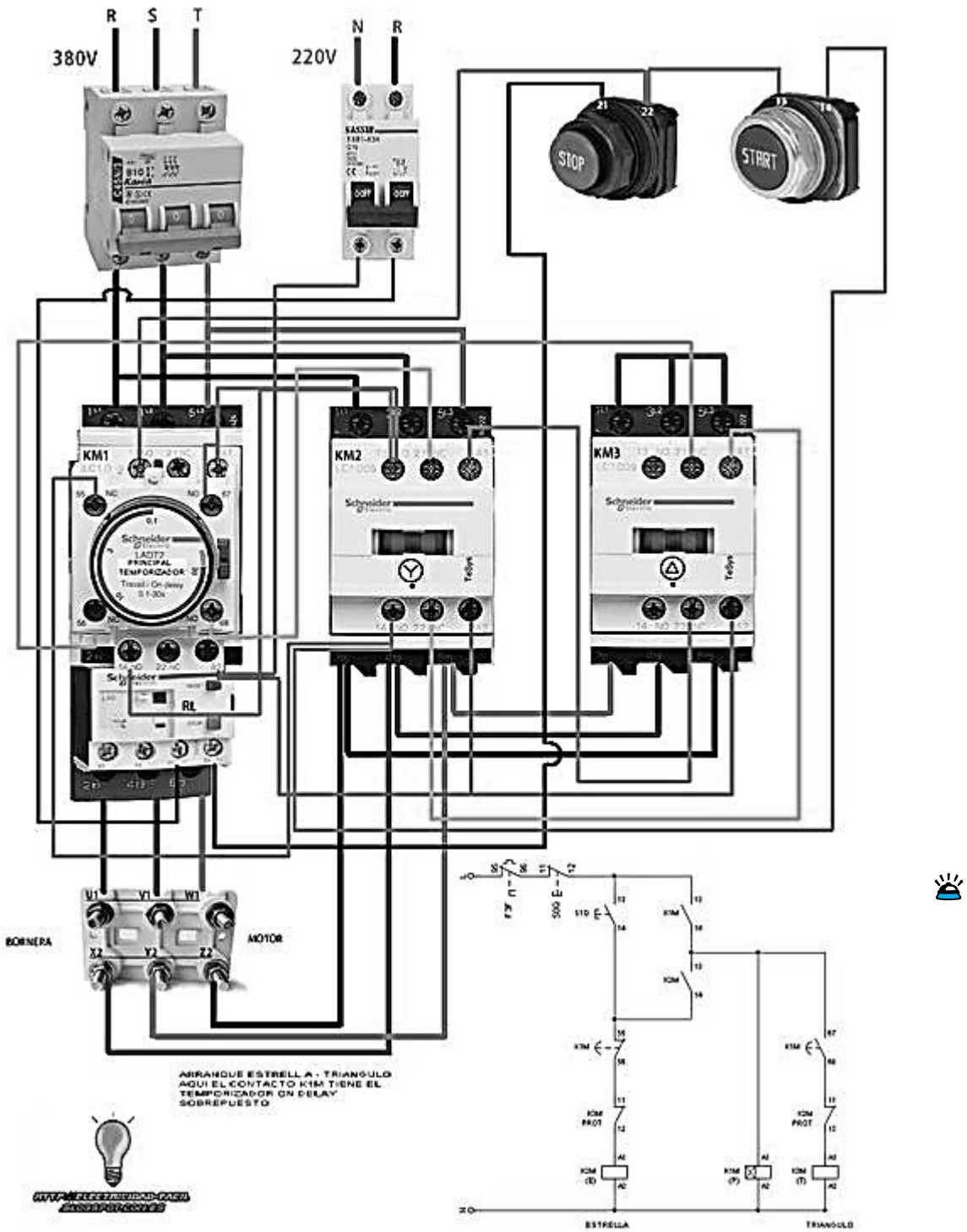
The drawing must include the following:

- Transmission line (HT)
- Standoffs/Insulator
- Connection points
- 3 × fuses
- 3 × transformers
- Low-tension line (LV)
- Neutral
- Earth connection

NOTE: A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks. **[20]**

QUESTION 4: ELECTRICAL MOTORS AND CONTROL DEVICES

FIGURE 4 shows a photograph of the components of an automatic star-delta type starter to control an electrical three-phase motor.



[Source: *http:// subirimagenes.net*]

FIGURE 2

Draw the complete circuit and improve the circuit layout where possible. Draw the main (power) circuit and the control circuit and improve/complete the item designation so that the final drawing will be ready for reproduction. **[20]**

QUESTION 5: WIRING OF PREMISES

Draw a plan view, wiring diagram and single line diagram for each of the following light-switch applications and indicate on the plan view where such a light-switch application will be used.

5.1 To control FIVE lights by using TWO switches, ONE switch must control THREE lights and the other switch must control the other TWO lights.

5.2 To control THREE lights by using TWO switches, the lights must be switch on and/or off by any of the switches.

5.3 To control FOUR lights by using THREE switches, the lights must be switch on and/or off by any of the switches.

A detailed drawing of the building/application is NOT required. Add ALL necessary electrical points on the plan. Take applicable regulations from SANS codes of practice into account. The drawing must be accompanied by a legend/key of the electrical installation symbols. **[20]**

TOTAL: 100

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