higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

INDUSTRIAL ELECTRONICS N6

13 APRIL 2015

This marking guideline consists of 9 pages.

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QUESTION 1

1.1 1.1.1 $T = \frac{L}{R} = \frac{3}{440} = 6.8m.s$

$Im = \frac{Vm}{R} = \frac{220}{440} = 0.5A$

$\frac{di}{dt} = \frac{Ime^{\frac{-t}{T}}}{T}$

$\frac{di}{dt} = \frac{Im}{T} = \frac{0.5}{6.818 \times 10^{-3}} = 73.333A/S$

(1)

or

$\frac{di}{dt} = \frac{E}{L} = \frac{220}{3} = 73.333A/S$

(1)

1.1.2 $Im = \frac{E}{R} = \frac{220}{440} = 0.5A$ (1)

1.1.3 $I = 0,5A\left(I - e\frac{^{-}10\ x\ 10^{-3}\ \sec}{6,8\ x\ 10^{-3}\ \sec}\right)$

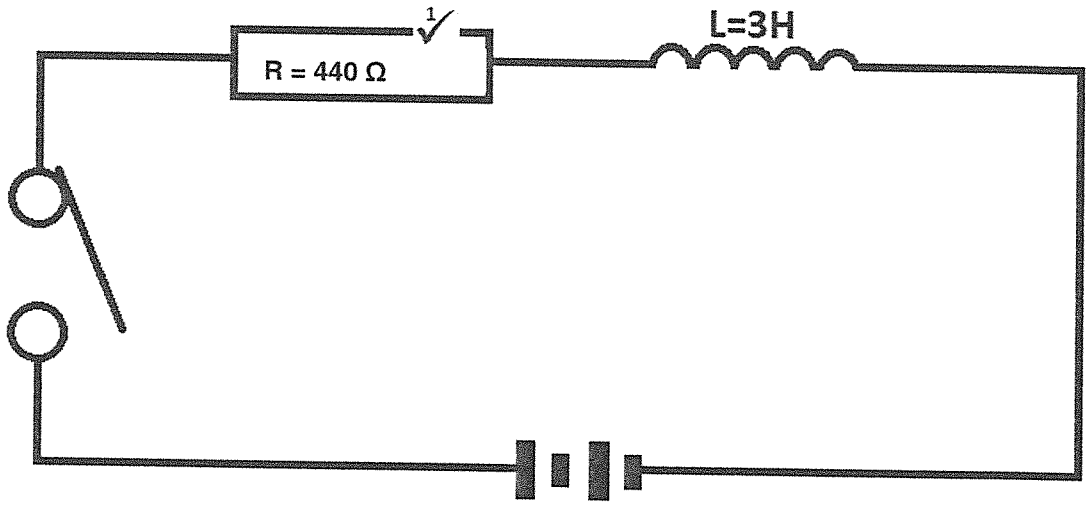
= 0,385 A (2)

1.1.4 Time required to reach final steady value = 5T

= 5 x 6.818 x 10^{-3}

= 34.1 m.s (2)

1.2



(2)

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1.3 1.3.1 False

1.3.2 False

1.3.3 False

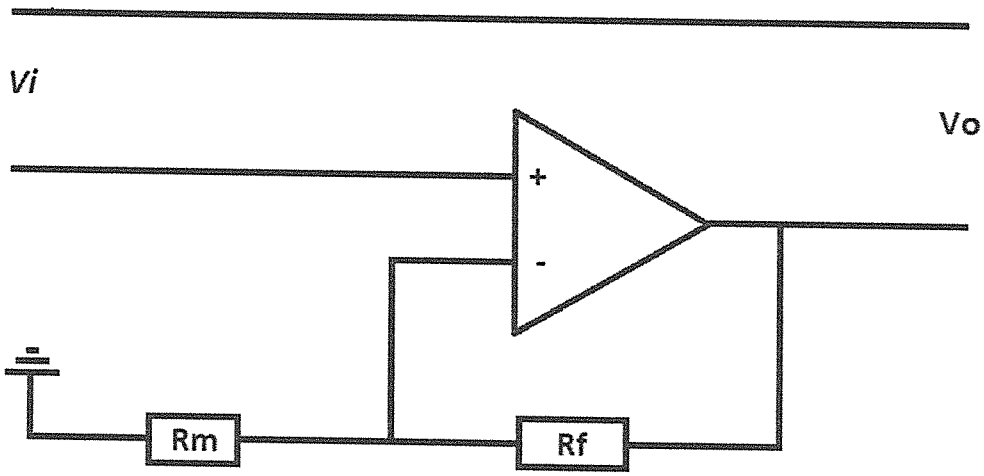
(3 x 1) (3)
[11]

QUESTION 2

2.1
- What is the physical quantity to be measured?✓
- Which transducer principle can be best used to measure this quantity?✓
- What accuracy is required for this measurement.?✓ (3)

2.2 2.2.1 Amplifier multiplier circuit.✓ (1)

2.2.2



(4)

$Vo=Vi[1+R_f/R_m]$✓

2.3 2.3.1 A circuit that provides the output signal at voltage or current levels suitable to operate a number of loads.✓

2.3.2 A circuit which essentially accepts inputs, providing high input impedance to minimise loading of the input signal.✓

(2 x 1) (2)
[10]

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QUESTION 3

3.1

- The direct piezo-electric effect✓
  This effect refers to when a crystal is subjected to an oscillating mechanical stress and this crystal accumulates a small electric charge that is directly proportional to the applied stress.✓✓

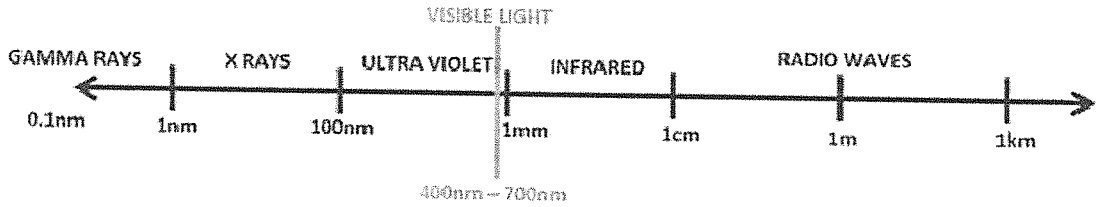
- The converse piezo-electric effect✓
  This effect refers to when an alternating emf or magnetic field be applied to a crystal, the crystal's then vary.✓
  The oscillating emf or magnetic field's magnitude and polarity will determine the direction and degree of crustal length variation.✓

(2 x 3) (6)

3.2

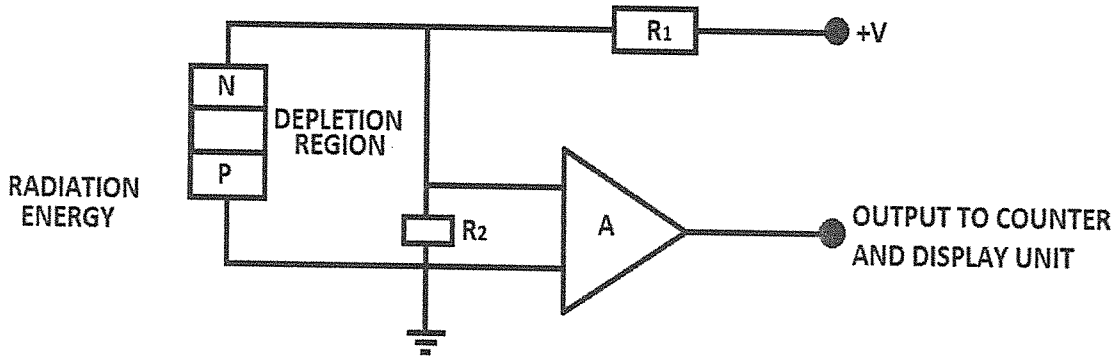
- Wear approved protective clothing✓
- Use level exposure indicators✓
- Premises must be clearly marked with applicable warning signs✓
- Proper shielding of work stations✓
- Decontamination of all personnel and equipment after exposur.✓
- Maintain correct storage, transport and waste disposal procedures✓ (6)

3.3



(7)

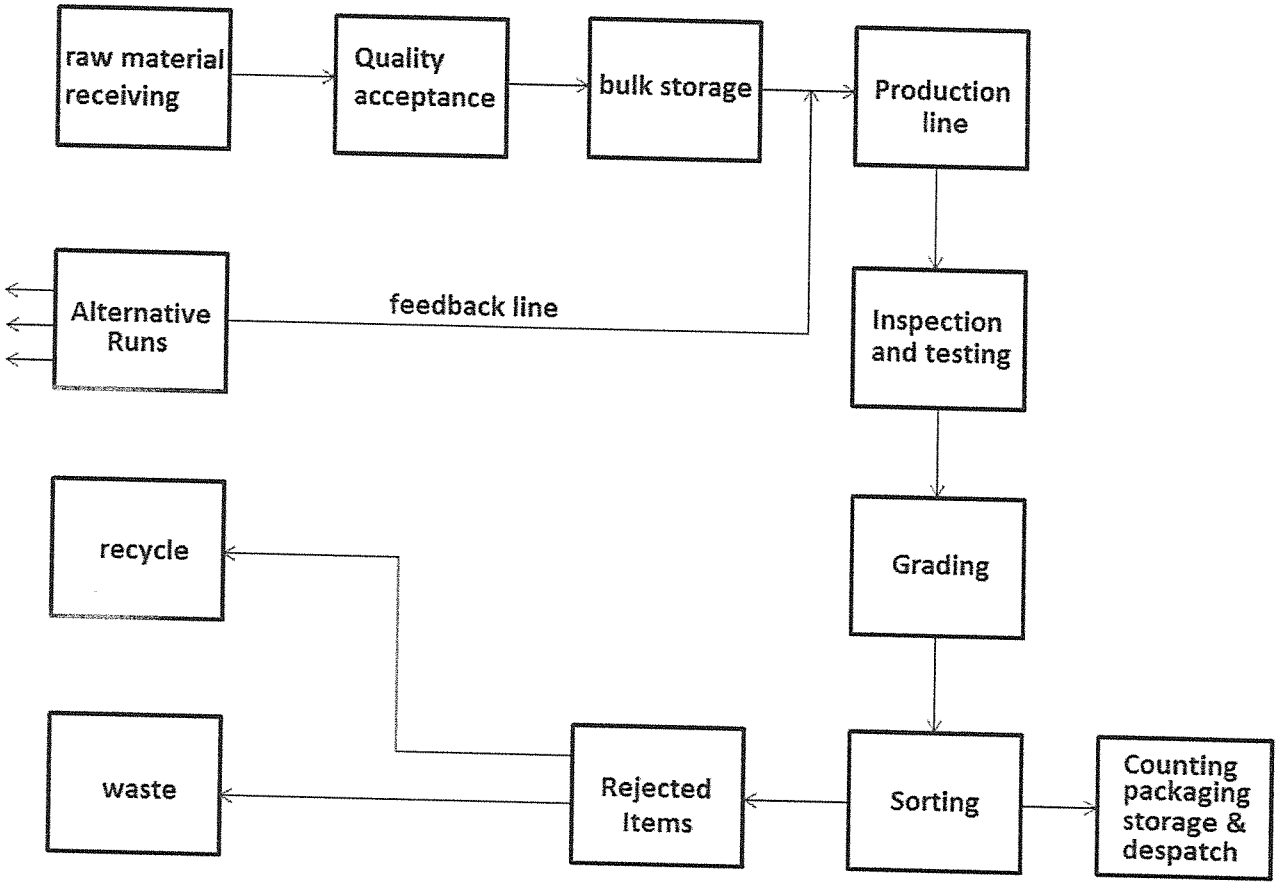
3.4



(4)
[23]

QUESTION 4

4.1



(6)

4.2 4.2.1

$$d = \frac{Vt}{2}$$

$$t = \frac{2d}{V}$$

$$= \frac{2 \times 1,2}{5 \times 10^{-3}} \checkmark$$

$$= 480 \times 10^{-6} S \quad \checkmark$$

$$P.R.R = \frac{1}{t} = \frac{1}{480 \times 10^{-6}} = 2.08 KHz \quad \checkmark$$

(3)

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4.2.2 $d = \frac{Vt}{2}$

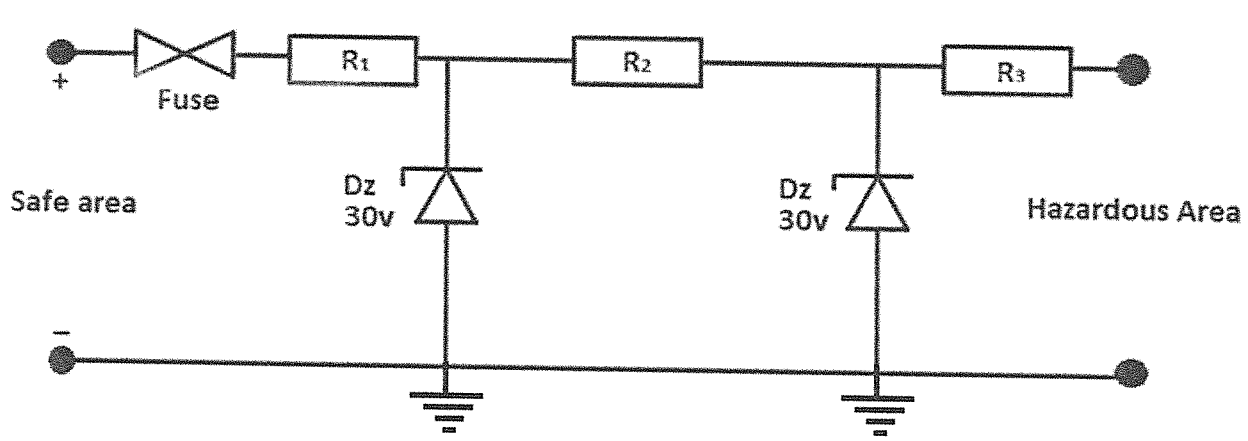
$= \frac{5 \times 10^{-3} \times 50 \times 10^{-6}}{2}$ ✓

$= 125mm$ ✓

(2)
[11]

QUESTION 5

5.1



(4)

5.2
- A transmitter/light source✓
- A medium for transmitting the light energy✓
- An optical receiver✓

(3)

5.3
- Inductive type✓
- Capacitive type✓

(2)

5.4 False ✓–

Expressed by means of a logic – AND function. ✓

(2)
[11]

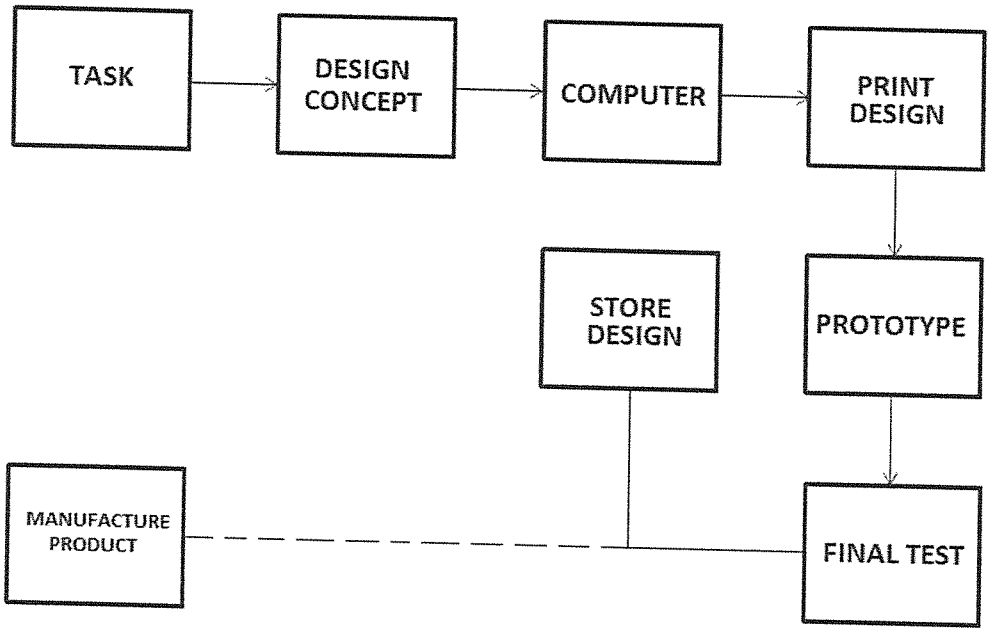
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QUESTION 6

6.1
- Speed of response/Setting time✓
- The time interval between the detection of the error and the completion of the corrective action ✓
- Offset/Residual Error/Steady state error✓
- The final difference between the desired value and the measured value of the controlled variable, after the system has responded to measurable change in the desired value/controlled output✓✓

(5)

6.2

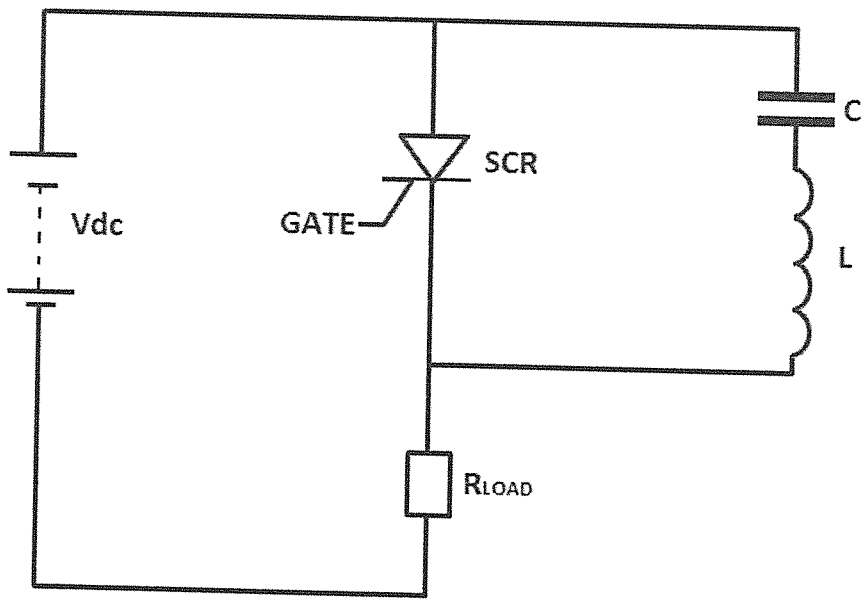


(4)

6.3
- High data transmission rate ✓
- Universal language ✓
- Communication interface✓

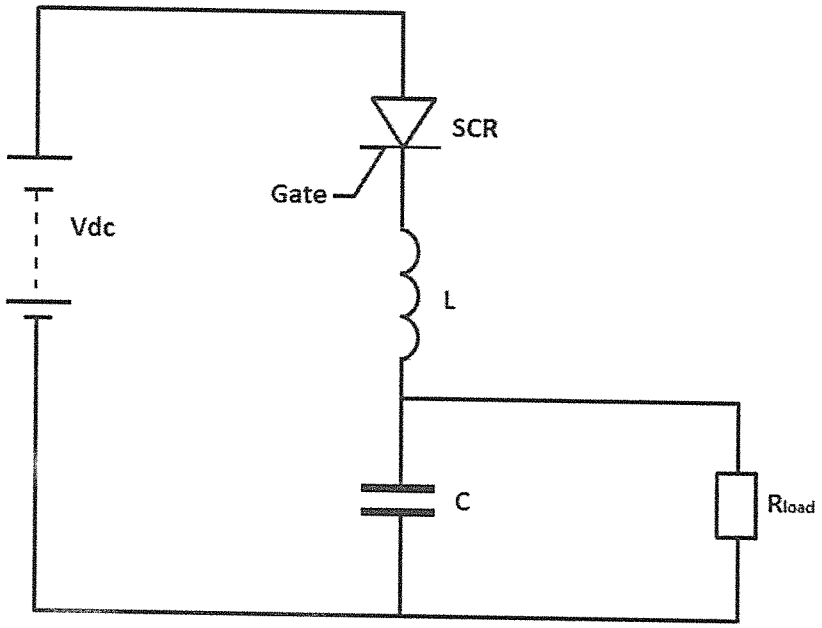
(4)

6.4 Series-resonance communication✓



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6.4 Parallel-resonance commutation✓



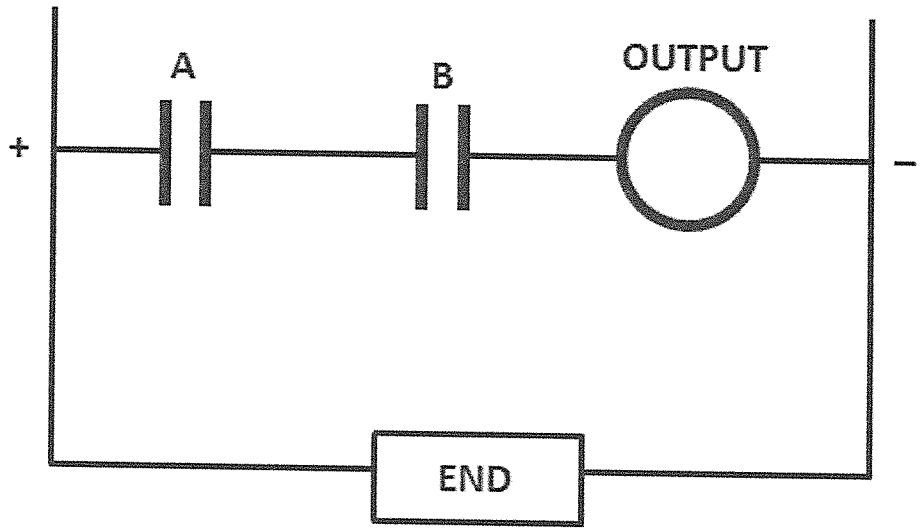
(8)

6.5 Plugging✓
Regenerative braking✓
Dynamic breaking✓

(3)
[24]

QUESTION 7

7.1



(2)

7.2 7.2.1 Erasable programmable read only memory✓

7.2.2 Electronically erasable programmable read only memory✓

(2 x 1) (2)

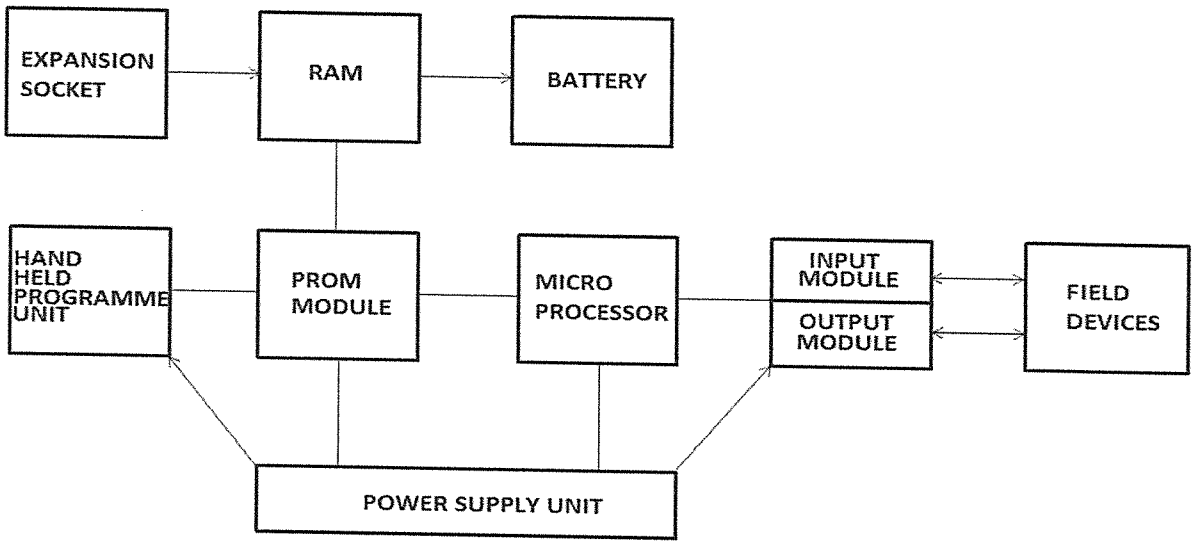
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7.3 EPROM is erasable by means of UV-light, while EEPROM is erasable by electronic technology. ✓

Or

EPROM is based on older technology and is more expensive than EEPROM, which is based on later technology.✓ (1)

7.4



(5)
[10]

TOTAL: 100

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