4.21 ELECTRICITY (448)

4.21.1 Electricity Paper 1 (448/1)

1. (a)	- Geothermal - Solar - Biomass - Wind power - Hydropower - Fuel **Any (4) x ½ = (2)**
(b)	▫ Artisan – a skilled worker who practices a trade or handcraft.**(1)** ▫ Technician – a specialist in the technical details of a subject or occupation. **(1)**
2. (a)	- Executive summary - Company description - Market Analysis - Organization and Management - Service or product line - Marketing and sales - Funding request - Financial projections **Any (4 x ½) = (2)**
(b)	- Install new electrical system (standardization). - Maintain all electrical installation in and working order. - Provide enough socket outlets for equipment in use. - Avoid overloading socket outlets. - Provide any accessible and clearly identified switch ratings. - For portable equipment connect to nearby socket outlets. **Any (4 x ½) = (2)**
3. (a)	- Never mix water and electricity. - Pay attention to what appliances are telling you. - Install ground fault circuit tests. - Make sure you are using the right size circuit/breakers and fuses. - Protect kids with outlet covers. - Avoid cube taps and other outlet stretching devices. **Any (2 x 1) = (2)**
(b)	(i) P.d. across = 500 x 0.02 = 10V. **(1)** P.d. across the junction is therefore (12 – 10) = 2V. **(1)** (ii) Power dissipated in the junction. P = VI = 0.02 x 2 = 0.04 W or**(1)** = 40mW.

4. (a)

Current entering = current leaving

Assuming 120Ω branch = V

$$150 = \left(V - \frac{12}{270} + \frac{V}{120}\right) \textbf{(1)}$$

$$0.15 = 13V - \frac{48}{1080}$$

$$162 = 13V - 48$$

$$210 = 13V \textbf{(1)}$$

$$\left(\frac{210}{13}\right) = V$$

Current in 120Ω branch = $\frac{V}{120}$

$$\Rightarrow \left(\frac{210}{13 \times 120}\right) = 134\text{mA} \quad \textbf{(1)}$$

(b)

e – waste is be defined as discarded computers, office electronic equipment entertainment devices, mobile phones, television sets, refrigerators. **(1)**
It includes used electronic destined for re-use, resale, salvage, recycling or disposal.

5. (a)

AND gate **(1)**

(b)

IP1	IP2	OUTPUT
0	0	0
0	1	0
1	0	0
1	1	1

(4 x ½) = (2)

(c)

(i) 101010 into decimal

(i) $2^5 2^4 2^3 2^2 2^1 2^0$

101010 **(1)**

= 32 + 0 = 8 + 0 + 2 + 0

= **42 ten** **(1)**

(ii) 23 into binary

2	23
2	11 – 1
2	5 – 1
2	2 - 1
2	1 -0

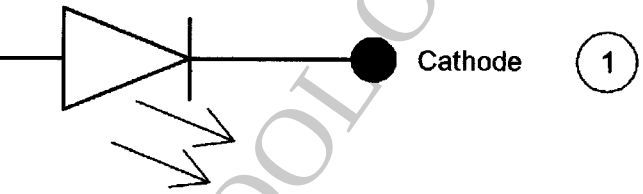
(1

= **10111 two (1)**

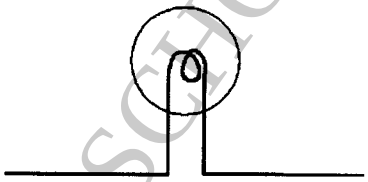
(d)

Circuit Symbols

(i) Anode Cathode 1



(ii)



1

6. (a)

(i) Copper – electrical conductors
(ii) Silicon – In semiconductor devices

Any (2 x ½) = 1

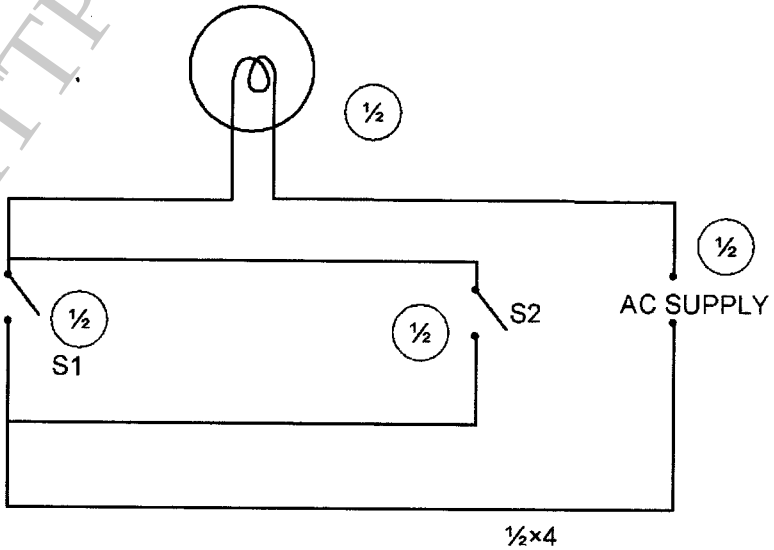
(b)

- Check fuse on the top plug.
- Check continuity of the supply cord.
- Check continuity of the coil in the iron box.

Any 2 x 1 = (2)

7.

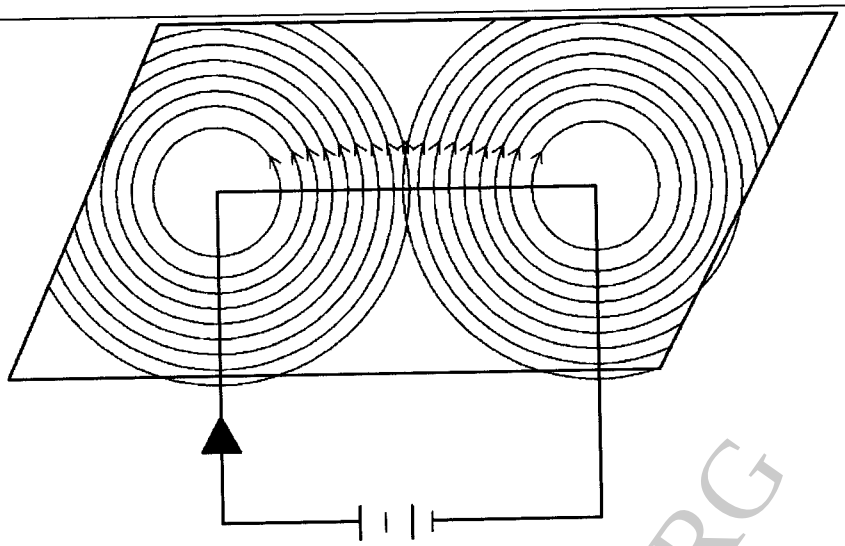
a)



(½ x 4) → (2)

	b) Brown Grey Red Gold **@ 4 x ½ → (2)**
8.	A – Pointer B – Air damping chamber C – Spring D – Balance weight E – Coil F – Moving iron **6 x ½ = 3**
9. (a)	Used in: - Filters - Sensors - Transformers - Motors - Energy storage **Any (4 x ½) = (2)**
(b)	Inductance is the property of an electric conductor or circuit that causes an electromotive force to be generated **(1)** by a change in the current flowing.
(c)	(i) $V_p \times I_p = V_s \times I_s$ As the ratio is 8:1, step down. Sec voltage $V_s = \frac{V_P}{8}$ } **(1)** $= \frac{3300}{8} = 4125$ } – **(1)** (ii) Assuming no losses input = output **(1)** $V_p \times I_p = V_s \times I_s$ $\Rightarrow I_s = \frac{V_P I_P}{V_S} = \left(\frac{6.6 \times 1000}{412.5}\right)$ **(1)** = **16A (1)**

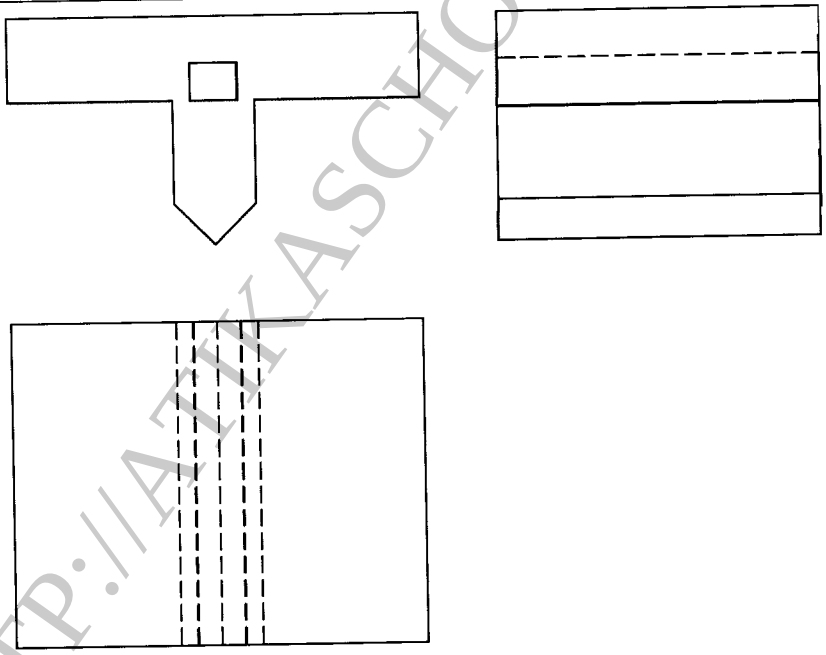
10.



(a) Correct - Magnetic flux
- Current entering board **(2 x ½) 1**
- Current leaving board **(2 x ½) 1**

(b) Correct current direction **1**

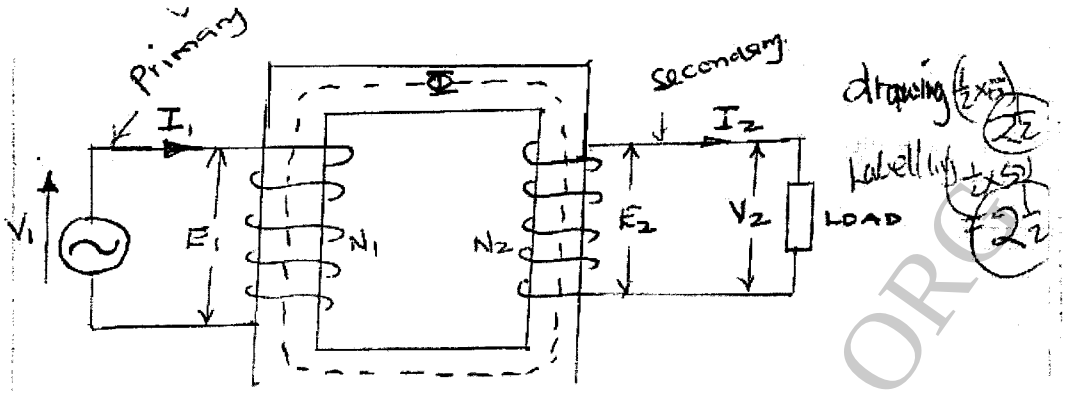
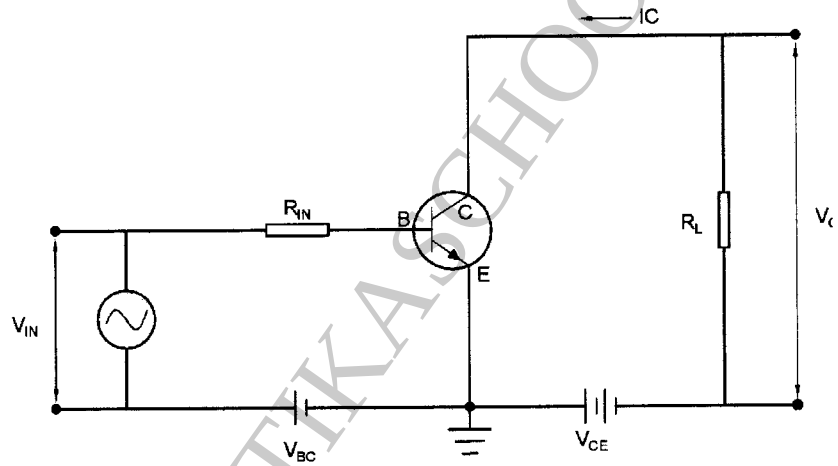
11.



Faces, Front Elevation (2 x 1) - 2
Faces End elevation (3 x 1) - 3
hidden details - 1
Plan face (1 x 1) - 1
hidden details (5 x 1) - 5
Correct placement - 1
TOTAL 13

12. (a) An alternator is an electrical machine which converts mechanical **(1)** energy into alternating electrical energy **(1).**

(b)	(i) A – magnet B – magnetic field C – Coil (armature) D – Slip rings E – Shift F – Brushes **Any 5X1=5**
(c)	At F.S.D. I = 0.030A V = 0.090V V_T (across terminals) = 100V ⇒Rm = resistance of multiplier Voltage (across resistor) = (100 – 0.090V) = 99.91V. **(1)** Since R = V/I ⇒ $R_m = \left(\frac{99.91}{0.030}\right)$ **(1/2)** R_m = 3330.33Ω **(1/2)**
(d)	A – Final circuit B – Consumer unit C – Main switch D – Energy meter E – Cut out F – Supply cable **(6 x ½) = 3**
13. (a)	A magnet is any material that affects iron or material containing iron. **(1)**
(b)	Properties of a magnet - All have 2 poles N and S. - Exert forces on each other. - Surrounded by a magnetic field. **3 x ½ = (1½)**
(c)	Theory of magnetism - Whether a material is magnetic or not. - In some materials groups of atoms are in tiny areas called domains. - Arrangement of domains determine state. - When domains move, the magnet is demagnetized or loses is magnetic properties. **(3)**

(d)	- Dropping or hitting it hard. - Putting it in a strong magnetic field opposite its own. - Increasing the temperature.
(e)	 **Drawing (5x 1/2) = (2½)** **Labelling (5x 1/2) =(2½)**
14.	 Correct components (6 x ½) 3 Labelling of components (6 x ½) 3 Correct configuration 1
(b)	**(1)** **(1)** Alpha ($\alpha = \frac{I_C}{I_C}$ and Betta ($\beta = \frac{I_C}{I_B}$ - **(2)** $\Rightarrow I_C = \alpha I_E = \beta I_B$ **(1)** as $\alpha = \frac{\beta(1)}{\beta+1}, \beta = \frac{\alpha(1)}{1-\alpha}$ **(2)** $\Rightarrow I_E = I_C + I_B$ **(1)**

15. (a)	(1) (½) (½) $X_C = \frac{1}{2\pi fC} = \frac{1}{2\pi(100) \times 470} = 3.39k\Omega$ = **(2)** (1) (½) (½) $X_L = 2\pi fL = 2\pi(100) \times 10 = 6.28\ k\Omega$ = **(2)** Here X_L is greater than X_C and thus (1) = **(1)** the circuit is more inductive than capacitive. (1) (½) Magnitude = $(X_L - X_C) = \lvert 6.28 - 3.39 \rvert$ = **(2)** (½) = 2.89kΩ inductive
(b)	**<u>ToolUse</u>** - Steel rule - measuring and marking - Scriber - marking - Engineers square - marking and checking for squareness - Centre punch - locating holes - Hacksaw - cutting metals - Twist chill - drilling - Files - deburring **Any other suitable answer (6 x ½) x 2 = 6**