30.20 ELECTRICITY (448)
30.20.1 Electricity Paper 1 (448/1)

1. (a) PROCEDURE
Switch off the supply or use a non-conductor to remove the victim from live conductor.
Place the victim in a comfortable position.
Call for medical assistance.
Apply first aid if necessary. 4 x ½ = 2 marks
Sequence =1

(b) ELECTRICAL TECHNICIAN
Supervises those below him
Trains those below him
Manages workshop production line
Assist workers when they encounter challenges
Any 4 x ½ .

2. (a) DRILLING A HOLE
Measure and mark the position of the hole.
Centre punch the hole.
Mount the work firmly in a vice.
Using the correct size of drill to drill the hole. 4 x ½

(b) PARTS OF A BATTERY
Positive plates consist of lattice type of grid of cast antimony lead alloy covered with lead peroxide.
Separators are thin sheets of porous insulators placed between positive and negative plates.
Casing made of vulcanized rubber, ebonite, plastic etc molded into partitioned container.
3 x 1

3. (a) METHOD OF GENERATING ELECTRICITY
Hydro
Geothermal
Diesel engines
Thermal 4 x 2

(b) Self inductance comprises one coil changing current which induces emf in itself while in mutual induction, 2 coils which are close changes current in one induced emf into the other.
(1½ x 2)

(c) Total charge $CT=\frac{C_1C_2}{C_1+C_2}=\frac{8\times12}{12\times8}=4.8\mu F$ (1½ marks)Ω

$Q = C_T x V = 50 \times 4.8 \times 10^{-6} = 240\mu C$ (1½ marks)

4. (a) RC Time Constant
Is the time taken to charge the capacitor to 63.2% of the charging voltage.
(1 mark)

(b) (i) $RT = 4 + 2 + \frac{12 \times 6}{12 + 6} = 6+4=10\Omega$ (2)

$TT=\frac{V}{R}=\frac{10}{10}=1Amp$ (1)

$P=1^2R=1^2 \times 20=2w$ (1)

5. (a) Ac Machines Types
Revolving armature
Revolving field 2 x ½

(b) Parts of Induction motor
Startor
Winding
Squrrel cage rator
Bearing

Frame/Yoke/Bod

(c) No. of pairs=$\frac{60F}{rpm}=\frac{60 \times 50}{1500}$ = 2 pairs

Any 4 x ½

6. (a) $R_T=\frac{V}{If.s.d}=\frac{1.5}{50 \times 10^{-6}}$ =0.03xX106=31Ω

(b) Advantage of digital measuring instrument
High sensitivity
Easy to read
More lagged and robust (withstands rough handling)
No effect from stray magnetism

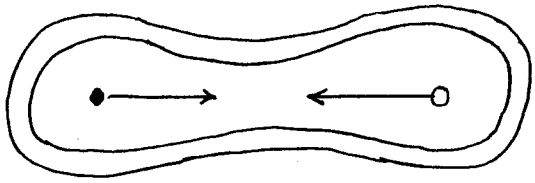
Any 3 x ½

(c) Identifying Faults
Physical inspection by looking at the circuit components to determine any change in colour, shape, e.t.c.

Circuit analysis – by taking measurements and comparing with what is in the service manual.

2 x 1

7. Magnetic flux



Polarity = 1
Pattern = 1
Force direction = 1

8. (a) Final Circuit
Outgoing circuit in a consumer unit (CU) to supply electrical directly via socket outlet.

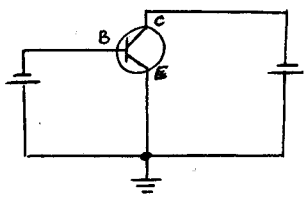
(1 mark)

(b) Regulations
(i) The total number of spurs stationery appliances shall not exceed the total number of socket outlets.
(ii) The rating of fuse or circuit breaker should be 30A.
(iii) Maximum floor area should be 100m2.
(iv) No standar 13A socket installed inside the bathroom
(v) Only 2.5mm2 cables should supply the 13A socket.

Any 4 x 1

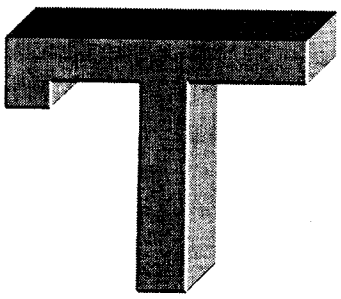
9. (a) Zener voltage
This is the point at which the zener diode breaks down when connected in reverse bias.
The voltage remains almost constant as the load current varies 2 x 1

(b) PNP Transistor



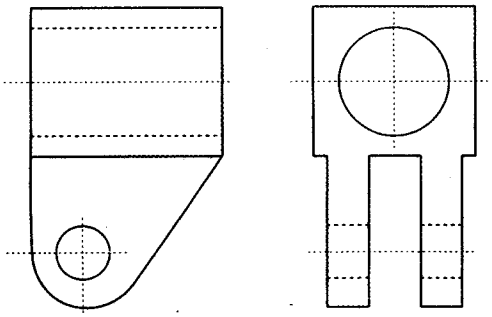
Correct PNP symbol = 1
"Terminal connections = 1½
Grounding/earthing =½

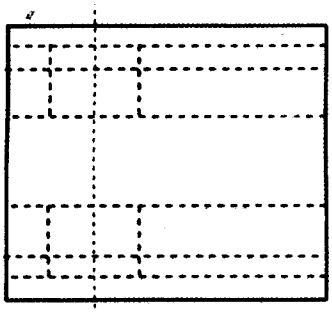
10.



Correct sketch= 2
Oblique=1
Proportion =1
1

11.





FE		
Faces (3 x 1)	=	3
Hidden details	=	1
EE		
Faces (3 x 1)	=	3
Hidden details	=	1
Centre lines	=	2
First angle projection	=	1
Neatness	=	1
		12

12. (a) Transistor
Power transistors are larger in size and usually have a heat sinks. 2 x 1

(b) Transistor ratio
DC ALPHA is the ratio of the emitter current to the collector current in a dc circuit.
2 x 1

AC BETA is the ac current gained in a common emitter amplifier. It is the ratio of the change in the output (collector) current to the change in the input (base) current.

2 x 1

(c) $\beta = \frac{IC}{IB} \Rightarrow 100 = \frac{10mA}{IB}$ (1)

$\therefore IB = \frac{10mA}{100} = 0.0001$ mA or $100\mu A$

From the diagram.

Vcc=IBRB +VBE 20V=IBRB + 0.7v

IBRB=(20 – 0.7)=19.3v

$RB = \frac{19.3}{IB} = \frac{19.3}{100\mu A} = 193K\Omega$

$I_C R_C = v_{cc} - V_{CE}$

$RC = \frac{Vcc - VcE}{I}$

$= \left(\frac{20-10}{0.01A}\right) = \frac{10}{0.01} = 1K\Omega$

13. (a) Fusing Current is the minimum current that will cause the fuse element to melt or blow while

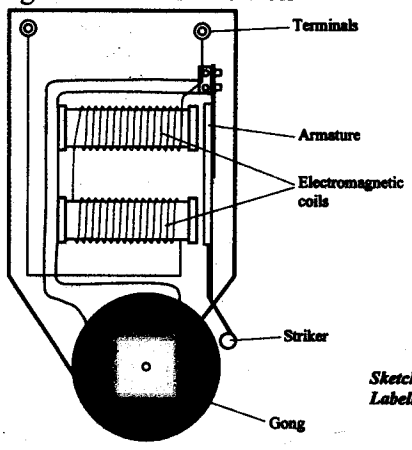
Current Rating is the maximum current the fuse is designed to carry for indefinite period without deterioration of its element. 2 x 1

(a) Disadvantages

Oxidation of fuse element
Dangers of replacing with incorrect wire
Unreliable – takes time to melt
Higher fire risk due to concentration of heat
Doesn't discriminate high transient current and continuous high current.

Any 2 x 1

(b) Single Stroke Electric Bell



Sketching = 2
Labelling (4x ½ = 2

Operation

When the push button is pressed, the circuit is completed and current flows to energize electromagnetic coil. The coil creates a magnetic field around it and attracts the soft iron armature.

The armature moves towards the electromagnets to the gong and remains in that position until the push button is released.

4 x 1

14. (a) Sine Wave

$f=\frac{1}{T}=\frac{1}{100\times10^{-3}}=\frac{10^3}{100}=10Hz$ (1½ marks)

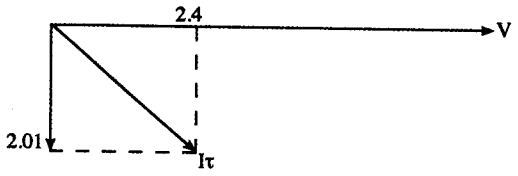
(b) Current 1, and 1_2

$X_L=2JI\ fL=2JI \times 50 \times 0.38 = 119.d\Omega$ (1½ marks)

$I_1=\underline{V}=\underline{240}=2.4A$ (1½ marks)
R 100

$I_2V=\underline{240}=2.01A$ (1½ marks)
X_2 119.3

Phaser Diagram

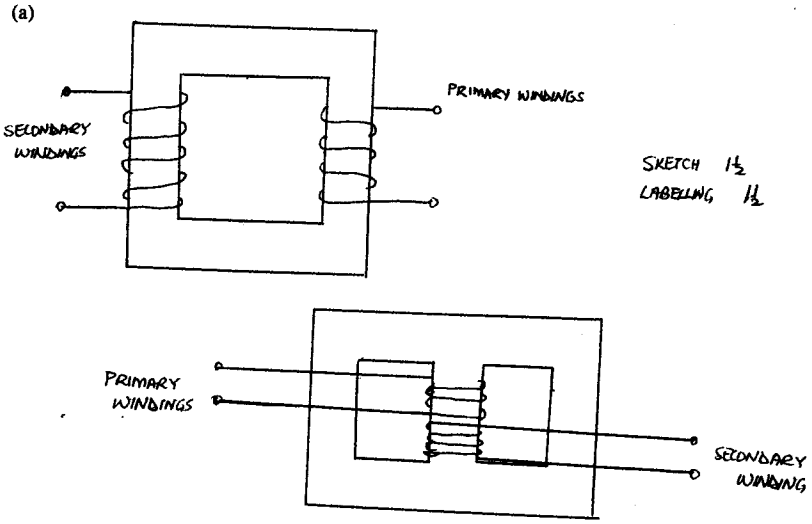


$I_T=\sqrt{2.4^2+2.01^2}+=\sqrt{5.76+4.040=3.3A}$ (2 marks)

Power factor Pf= $\frac{IR}{IT}=\frac{2.4}{3.13}=0.766$ (1 mark)

Phase angle $=CO^{-1}\ 0.766=40^\circ$ (1 mark)

15.



1

(b) (i) $Is\frac{P}{V_s}=\frac{10}{12}A$

$Is\frac{P}{V_s}=\frac{10}{12}A$

$I_p=\frac{V_S}{V_P}$ x $\frac{Is}{efficient}$

$=\frac{12}{40}x\frac{10}{12}\ x\frac{100}{96}$

=0.0434A

=43mA

1:

½½

|(ii) Input power = V x I =240 x 0.0434

=10.42w

Power loss = input power – output power

= 10.42 – 10

= 0.42w

1½1

1½1