RAMAKRISHNA MISSION

VIVEKANANDA CENTENARY COLLEGE, RAHARA

College Roll Number: 715

Exam Roll Number: 2022111243

Registration Number: A01-1112-117-014-2021 of 2021-2022

Semester: 1st Semester

Paper Code: ELTG GE-1

Date of Examination: 22.01.2022

B.Sc. End-Semester Examination

Group-A

4. α is known as the common base DC current gain in a transistor. It is the ratio of the transistor's collector current to the transistor's emitter current. $\left(\alpha = \frac{I_c}{I_E}\right)$

β is known as the common emitter current gain in a transistor. It is the ratio of the transistor's collector current to the transistor's base current. $\left(\beta = \frac{I_c}{I_B}\right)$

~~The transi~~

The transistor currents are related by:

Emitter current = Base current + Collector current

or, $I_E = I_B + I_C$ — (1)

$$\alpha = \frac{I_c}{I_E}$$

From (1), $\alpha = \frac{I_c}{I_B + I_c}$

$$\Rightarrow \alpha = \frac{I_C/I_B}{1 + \frac{I_C}{I_B}}$$

But, $\beta = \frac{I_C}{I_B}$

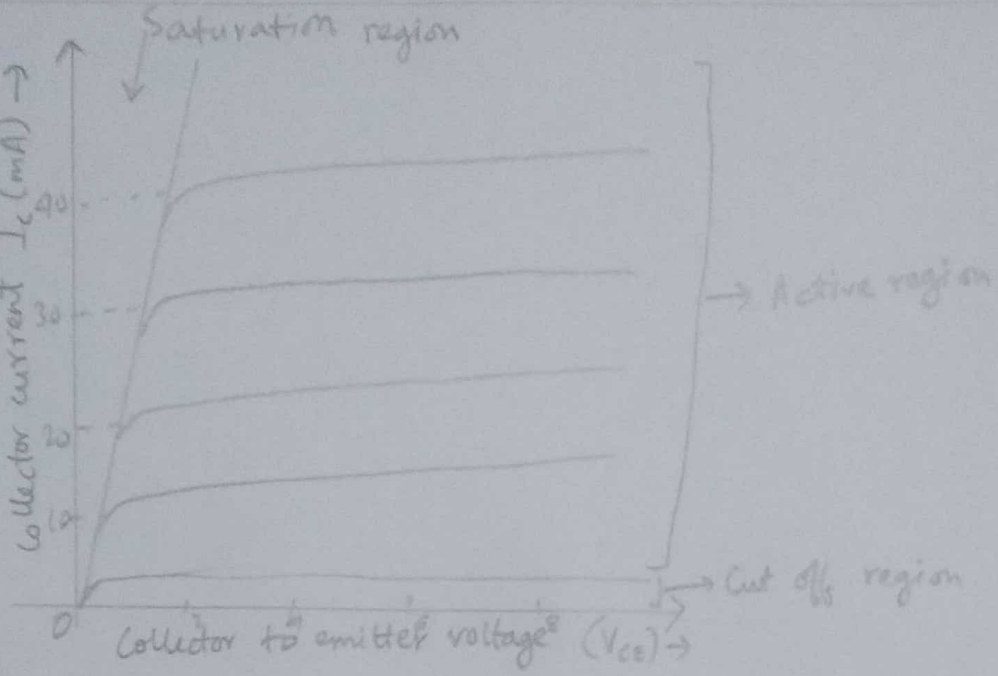
$$\Rightarrow \alpha = \frac{\beta}{1+\beta} \quad \text{or} \quad \beta = \frac{\alpha}{1-\alpha}$$

1. The superposition theorem states that in any linear, bilateral network having several energy sources, the current and voltage for any element is the algebraic sum of the effects produced by each energy source acting independently.

The superposition theorem is the result of the linear relation between voltage and current in a linear circuit. Hence, due to one source, each of the other sources is replaced by its internal impedence. All components must be bilateral, which means that the same relation between current and voltage exists for current flow in a single direction.

3. (a) When the temperature increases in a transistor, it increases the collector current of the transistor. This ~~results~~ results in ~~more~~ more power dissipated by the transistor, which in turn, further increases the temperature of the transistor. This ~~cycle~~ self-reinforcing cycle is known as thermal runaway, which may destroy the transistor.

(b)



8. (a) ~~Types Based on composition~~, Types of soldering materials used in PCB designing are:

- Lead alloy solders
- Lead free solders
- Flux core solders
- Silver alloy solders.

(b) The different categories of laminates available are:

~~Teflon laminates Teflon~~

- FR-1
- BT Epoxy
- High Tg Epoxy
- Polyimide
- Copper Clad (CCL)
- Teflon.

5. The degree of success achieved in stabilizing I_c with variations in I_{co} is expressed in terms of current stability factor S. It is defined as the rate of change of I_c with respect to I_{co} when both β and ~~I_B (V_{cc})~~ are I_B are held constant

$$S = \frac{d I_c}{d I_{co}}$$

Larger the value of S, greater the thermal instability, and smaller the value of S, more thermal stability in a transistor

Group-B

9. (a) An intrinsic semiconductor behaves like an insulator at 0K because the free electrons in the valence band of the intrinsic semiconductor will not carry enough thermal energy to overcome the ~~forbided~~ forbidden energy gap at 0K.

(b) ~~resistivity~~ 10^{-6} to 10^{9} S/m.

(c) For extrinsic semiconductors, the product of majority carriers and minority carriers are constant at fixed temperature and is independent of the donor and acceptor impurity added. This is known as mass action law.

14. (a) The essential components of a PCB are:

- Resistors
- Transistors
- Capacitors
- Inductors
- ~~Transformers~~ Battery
- Diodes

(b) Two advantages of surface mount technology are:

(i) Smaller and lighter PCBs: Surface mount technology PCBs are much smaller and lighter as surface mount device components are much smaller than their thru-hole counterparts.

(ii) High Signal transmission and high frequency: Because of short delay, PCB, especially double sided PCB and multilayer PCB are capable of high speed signal transmission.

Two disadvantages of Surface Mount technology are:

(i) Difficult inspection: Since most Surface ~~Mount~~ Mount Device components are small, and have numerous solder joints, they are very difficult ~~of~~ to be inspected.

(ii) Prone to damage: Surface Mount Device components can easily be damaged if they are dropped.

(c) We can prevent the PCB boards from contaminants by ~~s~~ using them in a clean, ~~environment~~ dry environment and by taking precaution that our skin or hair doesn't contaminate the board during usage.

---

12. (a)

HWR	FWR
(i) A half wave rectifier only allows one half-cycle of AC voltage waveform to pass, blocking the other half-cycle.	(i) A full wave rectifier converts both halves of each cycle of an AC signal into an intrinsic DC signal.
(ii) ~~The~~ Ripple factor of HWR is 1.21	(ii) Ripple factor of FWR is 0.482
(iii) Only one diode is required to construct a HWR.	(iii) A ~~If~~ FWR ~~one~~ consists of multiple diodes
(iv) HWR is less efficient than FWR	(iv) FWR is more efficient than HWR

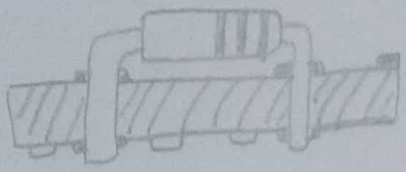
(b) One advantage of bridge rectifier is:

- Transformer utilization factor of bridge rectifier is higher than that of a centre-tapped rectifier.

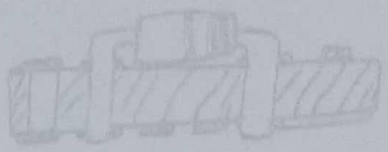
One disadvantage of bridge rectifier is:

Bridge rectifiers need more diodes for construction ~~ratho~~ than a centre-tapped rectifier.

15. (a)

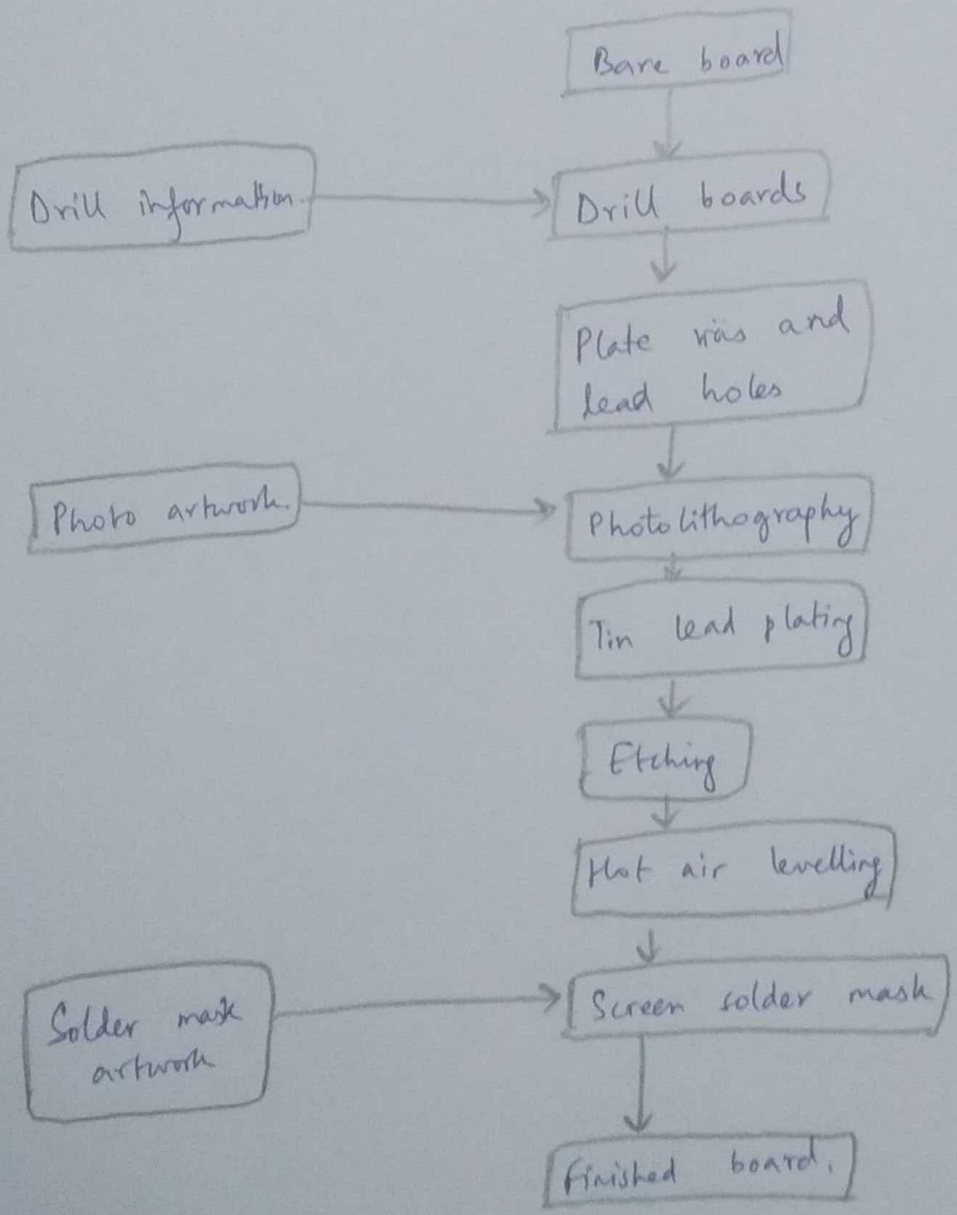


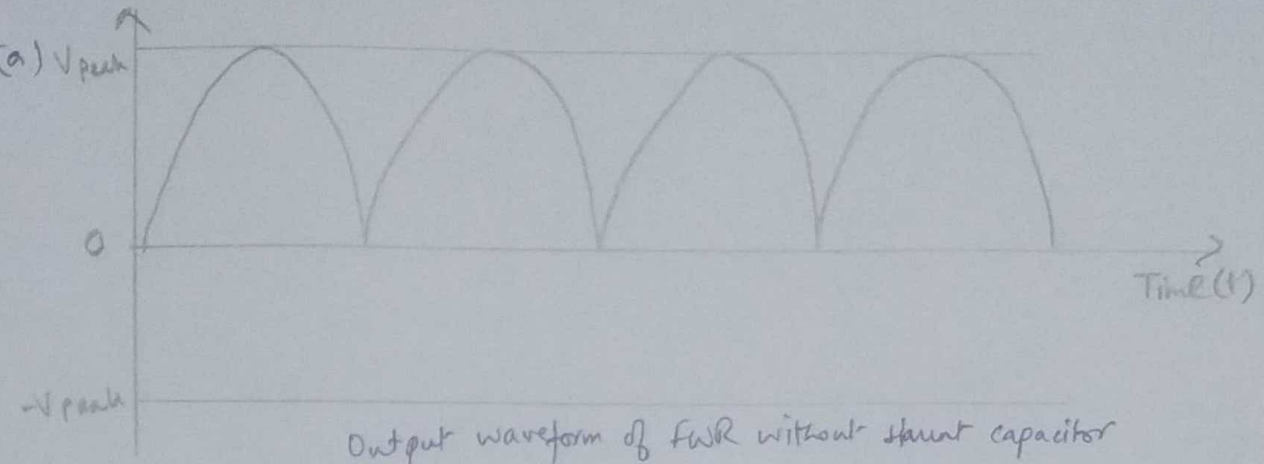
DSB non PTH



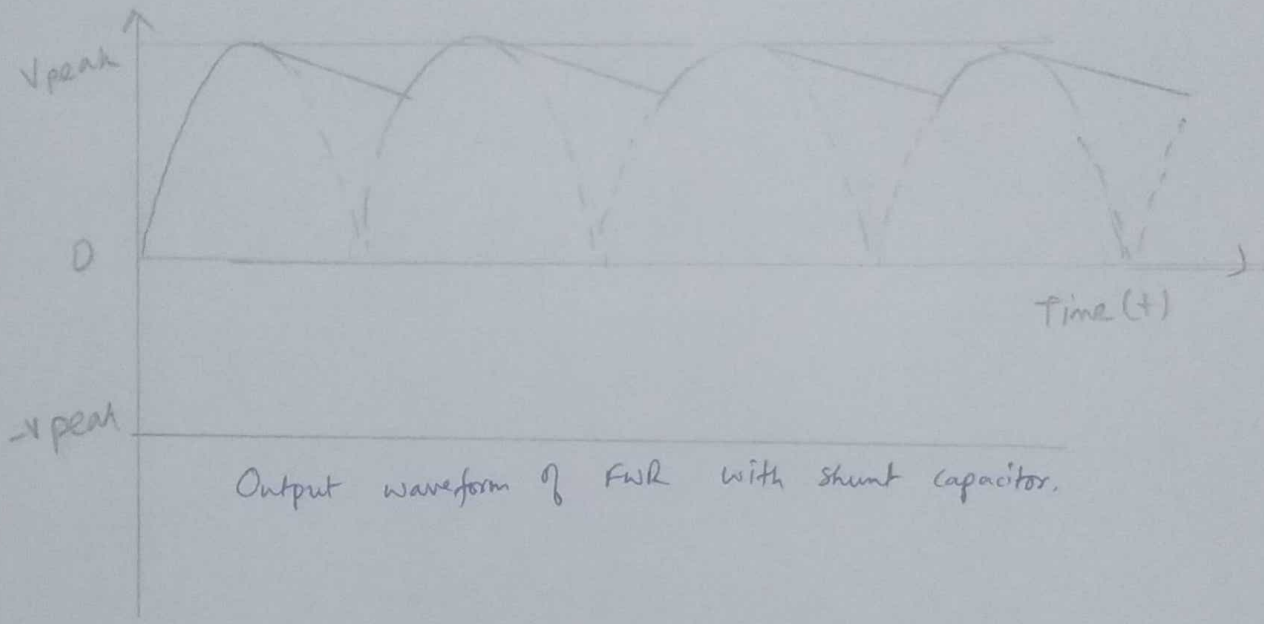
DSB PTH

(b)



13. (a) 

Output waveform of FWR without shunt capacitor



Output waveform of FWR with shunt capacitor.

(b) In large load current flows, inductor filter is preferred over a capacitor filter. This is because the inductor's impedance increases with increasing frequency and the high impedence in series tends to block high-frequency signals from getting to the load.