KSU CET

S1 & S2 Notes

2019 Scheme

Manifest the leadership in you

00EST130121905

PART II: BASIC ELECTRONICS ENGINEERING

(2019 Scheme)

Max. Marks: 50 Duration: 90 min

PART A

Answer all questions, each carries 4 marks.

12 Find the capacitance values for the following codes (i) 2n2 (ii) 104K.

13 What do you mean by majority and minority carriers in a semiconductor?

14 Describe the block diagram of a public addressing system

15 Narrate the working of a capacitor filter.

16 Write the frequency range and typical applications of VHF and UHF frequency bands. (5x4=20)

PART B

Answer one full question from each module, each question carries 10 marks

Module-IV

17 a) Explain the formation of potential barrier in a P-N junction diode. (5)

b) Draw and explain the V-I characteristics of a PN junction diode under forward and reverse bias. (5)

OR

18 a) Explain the working of an NPN transistor mentioning all current components. (6)

b) The dc current gain of a transistor in common emitter configuration is 100. Find its dc current gain in common base configuration. (4)

Module-V

19 a) Sketch the block diagram of a DC power supply and explain the role of each block. (5)

b) Draw and explain the working of a full wave bridge rectifier circuit. (5)

OR

20 a) Sketch the frequency response of a transistor amplifier and comment on the shape of the curve. (7)

b) What is the role of emitter resistor in an RC coupled amplifier? (3)

Module-VI

21 a) State the merits and demerits of Amplitude Modulation. (4)

b) Sketch the block diagram of a superheterodyne receiver and explain its working. (6)

OR

22 a) Describe the working principle of an antenna. (3)

b) Draw the block diagram of a GSM system and explain its working. (7)

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12)

(i) 2n2 = 2·2 nF

a = 2200 pF

2n2 = 222 - common capacitor code

(ii) 104k

third digit is 4, so four zeros after first two digit

10000 pF = 100 nF

13) * The less abundant charge carrier are called minority carriers.

eg:- In n-type, they are holes

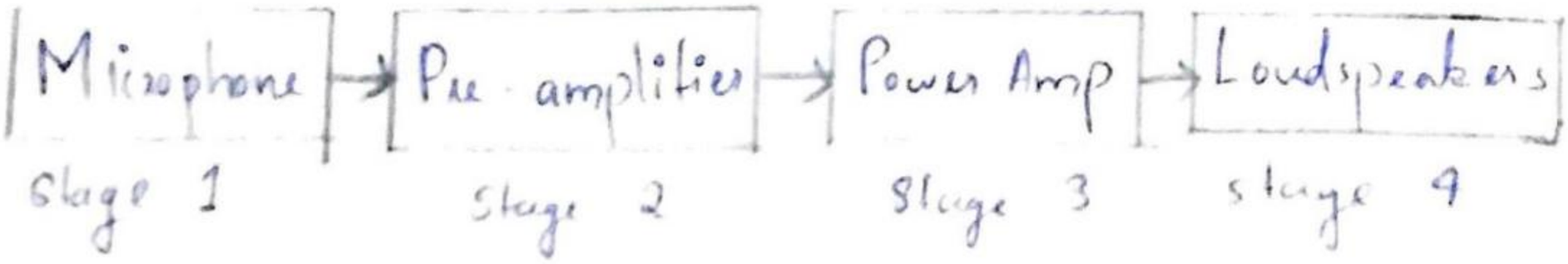
In p-type, they are electrons

* The charge carrier present in large quanity are called majority carriers

eg:- In n-type, they are electrons

In p-type, they are holes

14)



Stage 1 : Microphone (Transducer)

* Converts sound waves into electrical signals
* It is important that microphone create a faithful reproduction of sound waves as an electrical signal

stage 2 : Pre - Amplifier

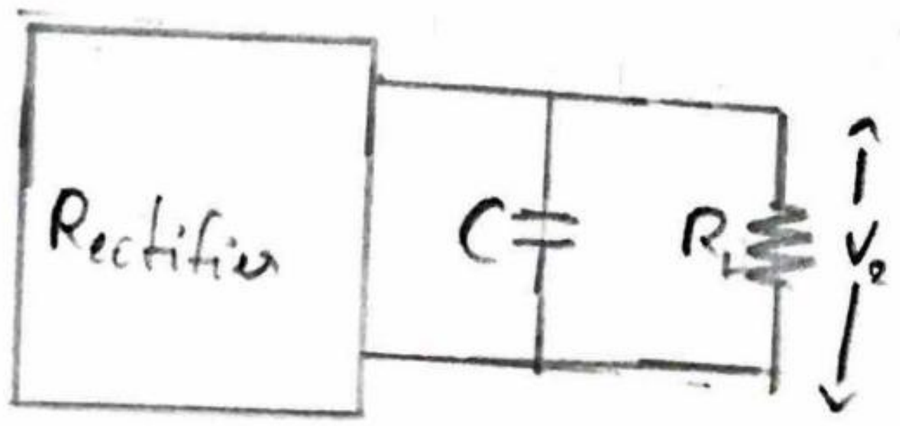
* Basically a voltage amplifier
* Its purpose is to take the small electrical signals from the microphone and increase the amplitude of the signal voltage.

Stage 3 : Power amplifier

* take this enlarged voltage signal, and boosts the current so that it is strong enough to drive the loudspeaker

Stage 4 : Loudspeaker

* The electrical signal is transformed back into a sound wave



* Connet a large value capacitor C in shunt with the load resistor.
* When the rectifier output voltage is increasing, the capacitor charges to peak voltage V_m. ~~After~~
* After the positive peak is passed, the rectifier output voltage falls which permits the capacitor to discharge through

* To reduce ripple in rectified output, we the capacitor to discharge slowly.

16) VHF - Very high frequency (30 - 300 MHz)

* Used for TV, FM transmission, radar, telepho

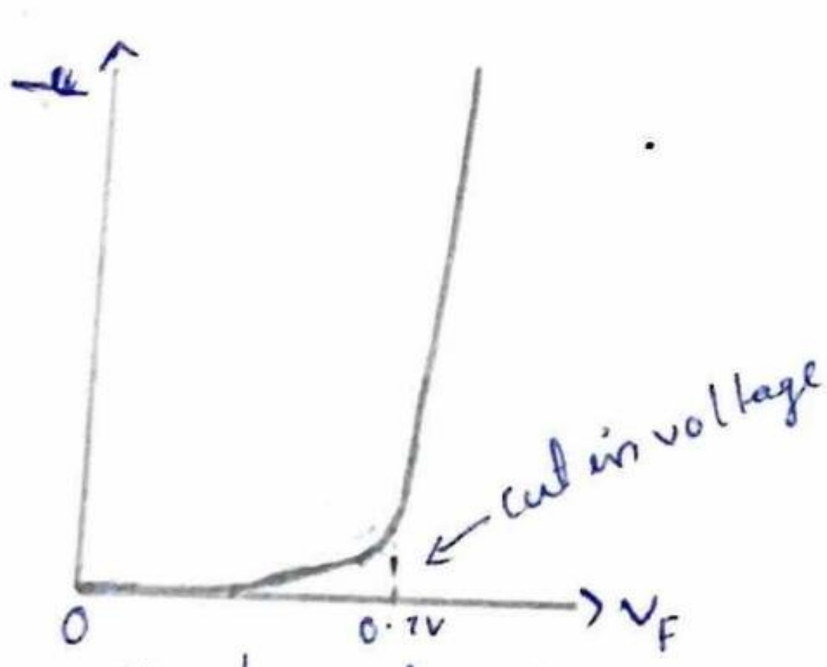
UHF - Ultra high frequency (300 MHz - 3 GHz)

* Used for TV and short distance commu

a) When a PN junction is formed, electron d
to p-side. They will meet at the junction a
hole recombination take place. This will result
of a region near the junction and it is
elections and holes. This region is called depleti
This region only immobile, donor and acceptor i
'd result in a seperation of charges. This charge
a potential difference between N side and P si
potential difference further movement of holes an
restricted. Hence this potential is called barri
that region may called as space-charge region

11b) Forward biased V-I characteristics:-

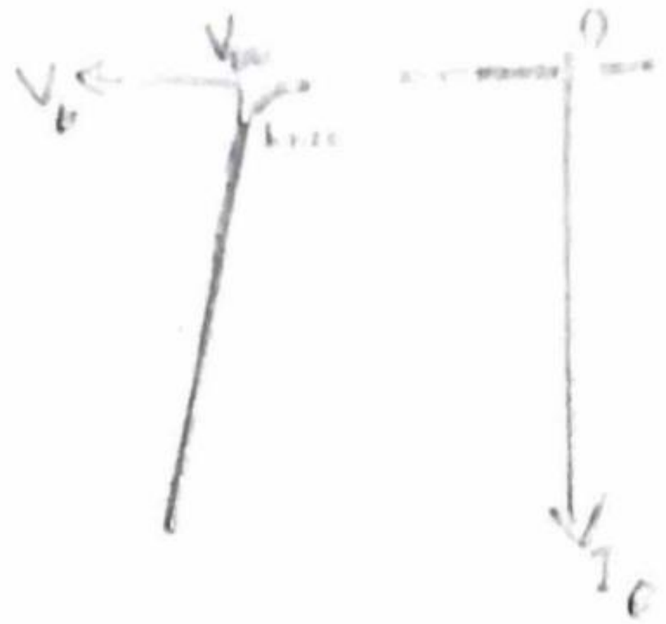
* The applied voltage (V_F) increase beyond the certain value, the forward current I_F increases sharply
* The diode permits the current to flow only if external applied voltage overcomes the barrier potential
* Minimum voltage required for the diode to conduct is called cut-in-voltage.
* If forward voltage is increased beyond a certain safe value, it will produce an extremely large current which may destroy the junction due to overheating



VI characteristics

Reverse biased ~~condition~~

* The reverse current caused by thermally produced minority carriers is called reverse saturation current or leakage current.
* If reverse voltage is increased continously beyond a knee value, breakdown of junction occurs



(8 a)

n - p - n transistor

mainly there are three regions

1. Emitter, E
   * Supplier carrier
   * Heavily doped
   * Emitter region & collector region are same type
   * Medium in size
2. Base, B
   * Lightly doped
   * Smallest region
   * control - The flow of current
3. Collector, C
   * Collect carriers
   * Moderately doped
   * largest region

Working:-

(a) In NPN transistor,

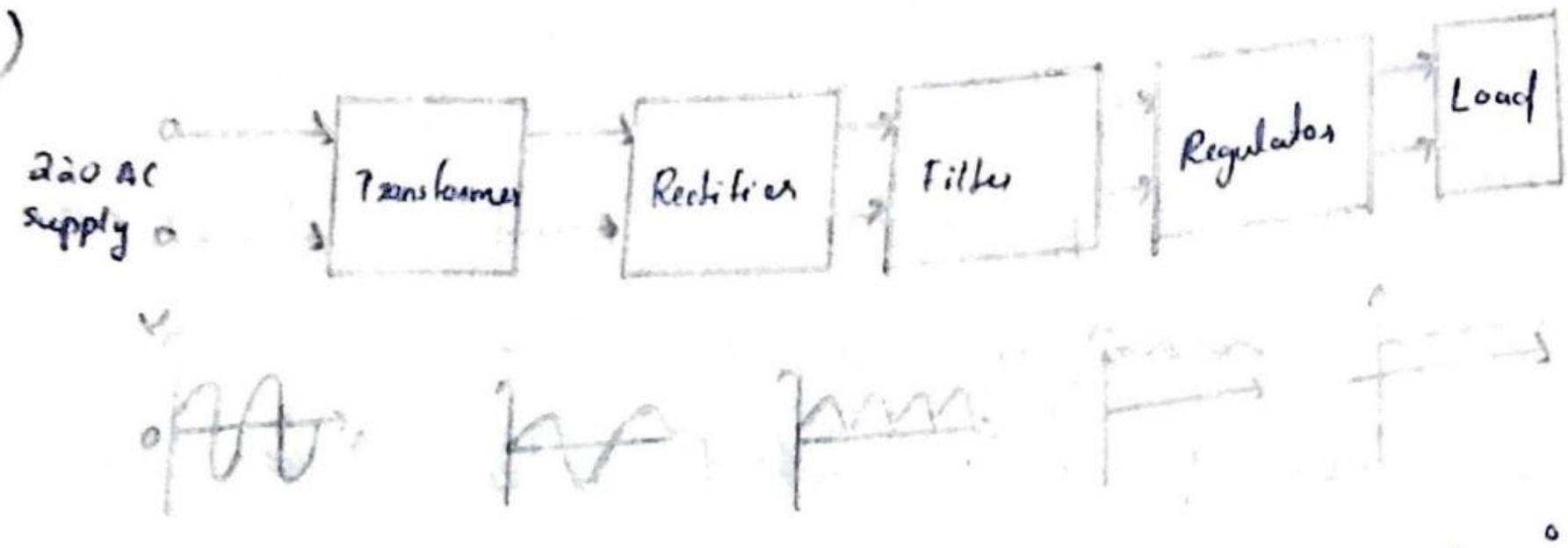
The forward biased is applied across the emitter-base junction, and the reversed bias is applied across the collector base junction. The forward biased voltage V_{EB} is small as compared to the reverse bias voltage V_{CB}. The emitter of NPN transistor is heavily doped. When the forward bias is applied across the emitter, the majority charge carrier move towards the base. This causes the emitter current I_e. The e^- enter into the p-type material and combine with the holes. Base is lightly dope. So only few electrons are combined and remaining constitutes the base current I_B. This base current enters into the collector region. The reverse bias potential of the collector region applies the high attractive force on the electrons reaching collector junction. Thus attract or collect the electrons at the collector.

(b)
$$\alpha = \frac{\beta}{\beta + 1} \qquad \beta = 100$$

$$= \frac{100}{101}$$

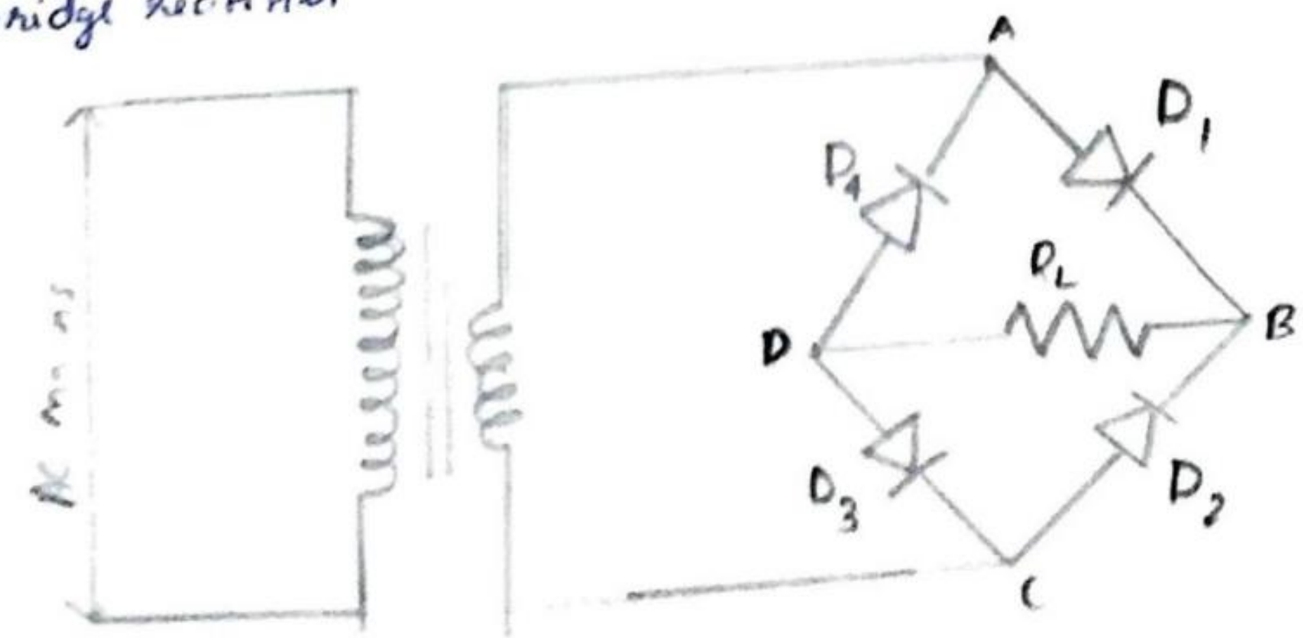
$$= 0.99 //$$

19 a)



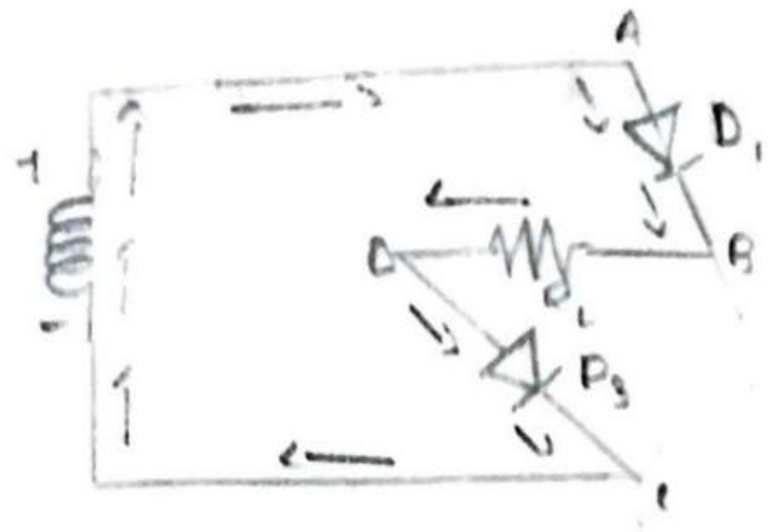
1. step down transformer :- It step down 220v AC power supply into an AC of required level
2. Rectifier :- Circuit that converts AC into pulsating DC.
3. Smoothing / Filter :- A filtering circuit is used to smoothen the variations present in the rectified circuit.
4. Regulator :- Used to control the unregulated input level to a desired DC output level.
5. Load :- The load is device which is used the pure DC output from the regulated DC output

b) Full wave bridge rectifier



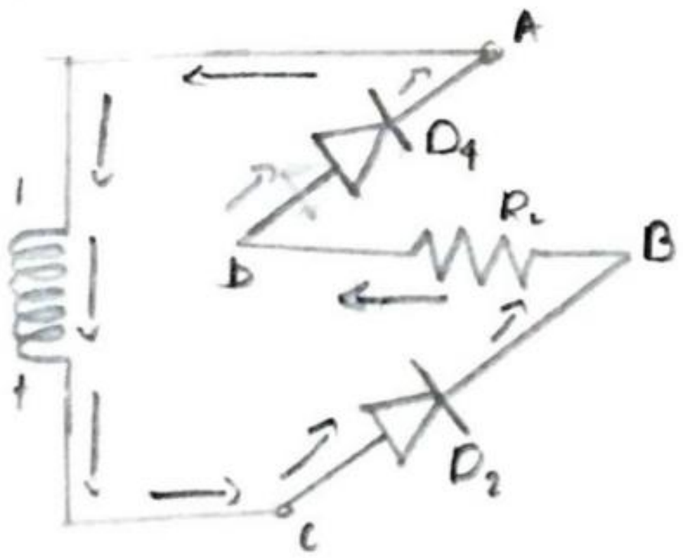
Working :-

Case - 1 :- During +ve half cycle



Here the terminal A is positive with respect to C. Diodes D_1 & D_3 are forward biased. At this instant, the diodes D_2 and P_1 are reverse biased. So the current flows through D_1, R_L and D_3

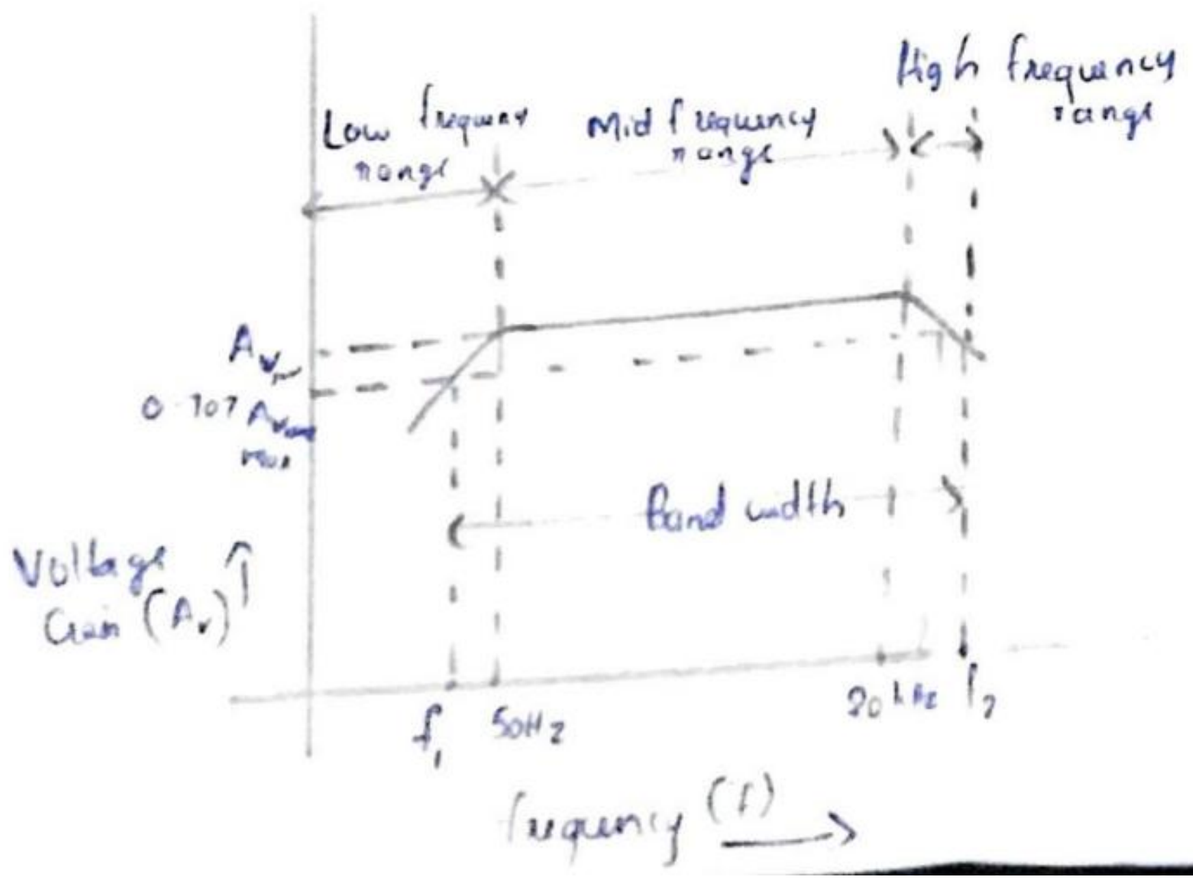
Case-2 :- During -ve half cycle



Here terminal A is negative with respect to C. Diode D_2 & D_4 are forward biased. At this instant D_3 & D_1 are reverse biased. So the current flows through D_2, R and D_4.

20)

a)



It is evident from the graph that the voltage gain drops off at low frequencies and at high frequencies, while it remain constant in mid frequency.

1) At low frequencies (ie, below 50 Hz)

* At low frequencies, capacitor offers a high reactance
  - → Coupling capacitors can't effectively couple
  - → Emitter bypass can't effectively bypass AC signal
* As a result, the voltage gain drops off at low frequencies.

2) At high frequencies (ie, above 20 kHz)

* At high frequencies, capacitor offers a low reactance
  - → Coupling capacitor acts as short circuit
  - → Short circuiting effects of junction capacitors of the transistor
* As a result, voltage gain drops off at low frequencies.

3) At mid frequencies (50 Hz to 20 kHz)

* Effect of coupling capacitor is such that it maintain a constant voltage gain
* As the frequency increases, reactance of coupling capacitor decreases, which tends to increase the gain
* Due to low capacitive reactance, there will be higher loading effect and gain will be reduced.
* These two factor cancel each other and constant voltage gain is maintained

b) The Emitter by pass capacitor (C_E) is mainly to eliminate It bypass only AC signal to ground. So dc components pass emitter resistor.

This ensure that biasing and stability of transistor is not affected. Without Emitter capacitor, the voltage gain of stage would be lost.

21

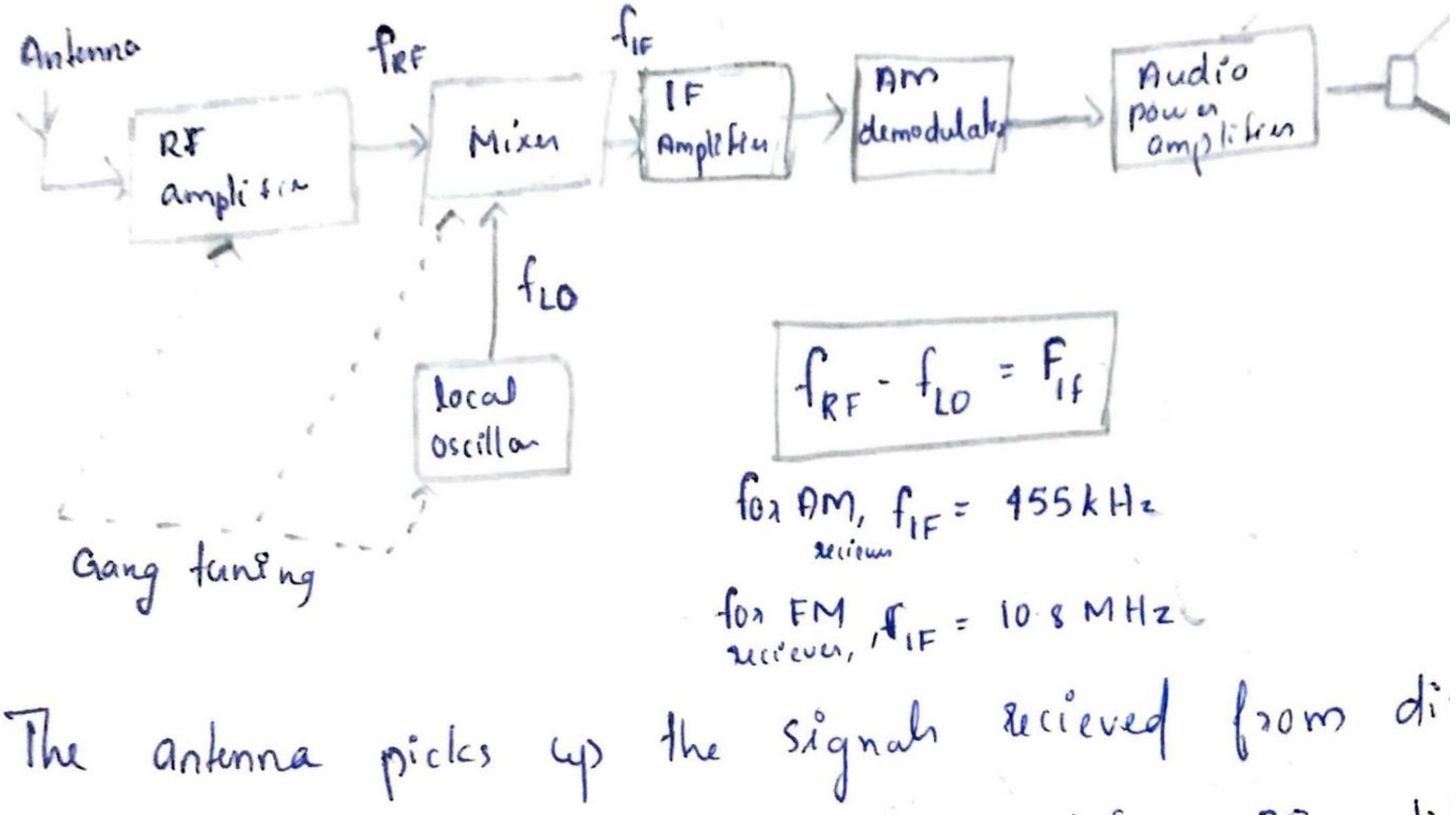
a) Advantages:-

* Easier to implement
* Demodulation can be done using few components and a circuit
* The recievers used for AM is very cheap

Disadvantages:-

* Low efficiency
* Small operating range
* Poor audio quality

21b) Superhetrodyne reciever



$$f_{RF} - f_{LO} = F_{IF}$$

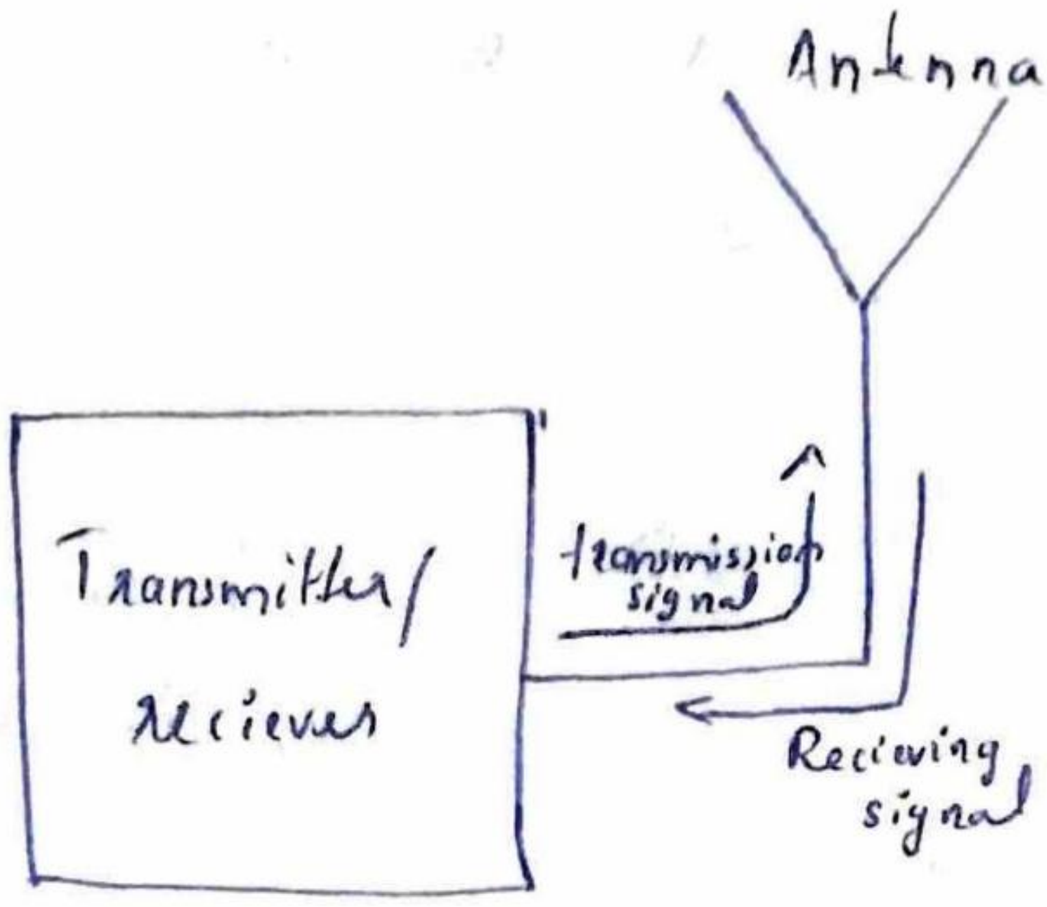
for AM recievers, $f_{IF} = 455\,kHz$

for FM recievers, $f_{IF} = 10.8\,MHz$

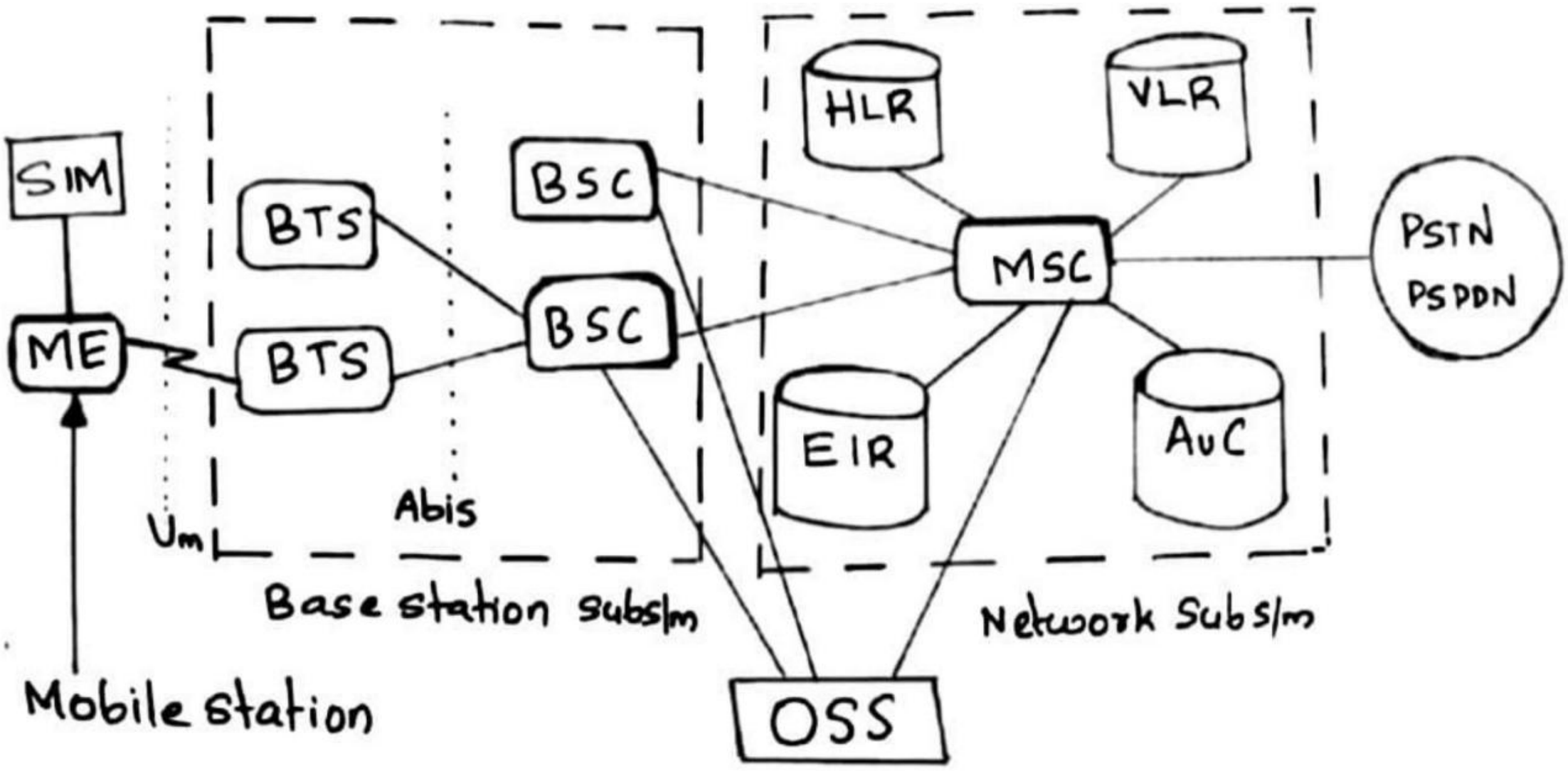
The antenna picks up the signals recieved from di broadcasting stations and fed to RF amplifier. RF ampli Selects only the one to decide (carrier) signal frequency o it rejects all other frequency, also amplifies the we incoming signals.

⇒ The mixture section converts the incon
to an intermediate frequency (IF) with
oscillator.
⇒ IF amplifier amplifies the IF signal fro
⇒ AM demodulator demodulates the ampli
extracts the audio message signal. This audi
amplified by an Aa audio power ampl
is directly given to loud speaker.

22 a)



A stationary charge will create an electri
-The charge is moving with an accelleration. Th
will vary. This timely varying electri field
field. The change in magneti field will also
electri field. Thus the mutual interaction of
magneti and electri field produces an electroma



The mobile station (MS)

→ consists of the physical equipment such as the mobile equipment, and smart card called the SIM (subscriber Identity Module).

→ SIM provides personal mobility, so that user can have access to all subscribed services irrespective of both the location of the terminal and the use of a specific terminal.

→ By inserting the SIM card into another GSM cellular phone, the user is able to receive calls at that phone, make calls from that phone, or receive other subscribed services.

ME + SIM = MS

→ The mobile equipment is uniquely identified by the International Mobile Equipment Identity

→ The simcard contains the International Subscriber Identity (IMSI) identifying the subscriber, a secret key for authentication, and other user information. The IMEI and the IMSI are independent, thereby providing personal mobility.

→ The SIM card may be protected against unauthorized use by a password or personal Identity Number.

Base station Subsystem (BSS)

consists of BTS (Base transceiver station) and BSC (Base station controller)

→ Base transceiver station (BTS) handles the radio interface to the mobile station. The base transceiver station is the radio equipment.

→ BTS encodes, encrypts, multiplexes, modulates, and feeds the RF signals to the antenna.

→ It communicates with mobile station and Bsc.

→ Base station controller provides the control functions and physical links between the MSC and BTS. It provides functions such as handover, cell configurationdata and control of RF power levels in BTS.

→ A number of BSC are served by
→ BSC manages the radio resc
or more BTS. It handles ra
setup, frequency hoping and ha

Network switching Subsystem (NS

It consists the following

a) Mobile switching center (M
b) Home location Registers (H
c) visitor location Registers (
d) Authentication Center (AuC)
e) Equipment identity regis