EX NO: 1

Astable Multivibrator

Aim:-

To design and set up an astable Multivibrator for a given time period of 1ms.

Components Required:-

SL No	Components	Specification	Q ty
1.	IC μA 741	op-amp	1
2	Resistor		
	⋮	⋮	⋮

Design

$$T = 2RC \ln\frac{(1+\beta)}{(1-\beta)} \quad \text{where } \beta = \frac{R_2}{R_1 + R_2}$$

Let $\beta = 0.5$, $R_2 = 10k\Omega$ then $0.5 = \frac{10}{R_1 + 10}$

$\therefore R_1 = 10k\Omega$

$T = 2.2RC = 1ms$

$C = 0.1\mu f$

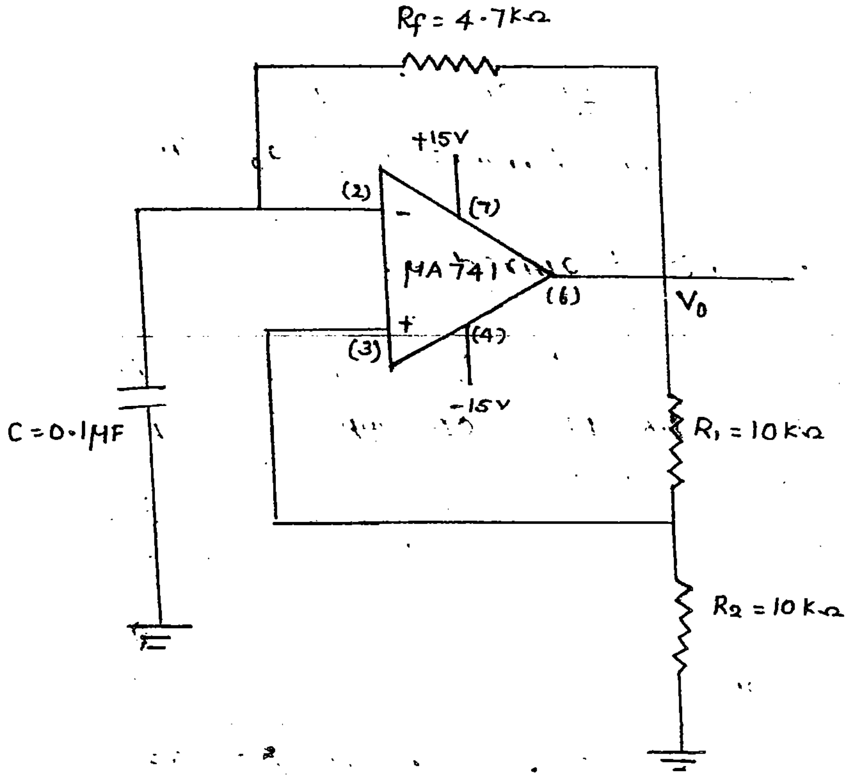
$$\therefore R = \frac{10^{-3}}{0.1 \times 10^{-6} \times 2.2}$$

$R_f = 4.5k\Omega \approx 4.7k\Omega$

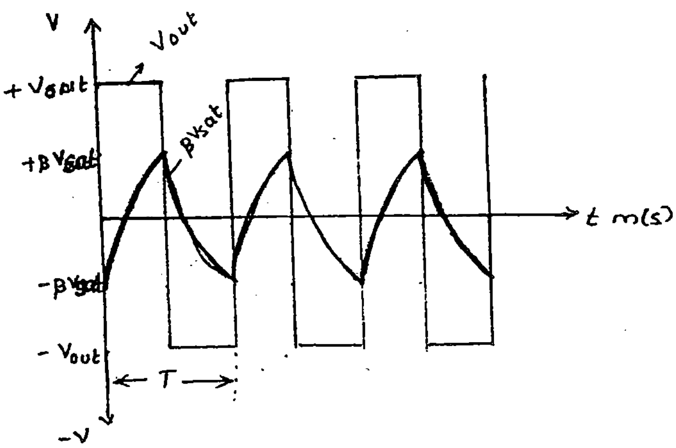
Procedure

1) check all components & IC's are working properly
2) Set up the ckt as per ckt dgm
3) Apply the supply voltage and ground and observe the o/p's
4) Verify the o/p's and plot waveforms.

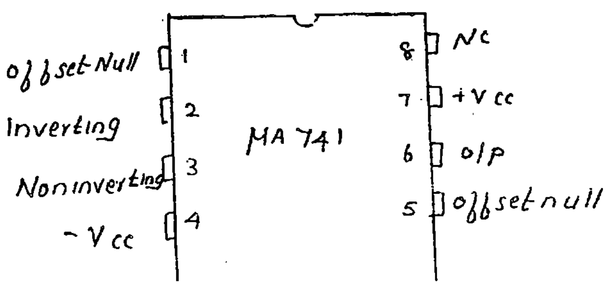
Circuit diagram



Waveform



Pin diagram



Viva Questions

1. What is a multivibrator
   It is basically a two stage amplifier with o/p of one supplied back to the i/p of the other

2. What are the diff types of multivibrator
   Astable, Monostable, & bistable.

3. What is an astable or free running multivibrator
   It has 2 quasi stable states and no stable state. Its o/p changes its state from one quasi state to the other. It does not require any extern trigger i/p to change its state.

4. Applications of astable multivibrator
   a) As a rectangular wave generator
   b) As a square wave generator
   c) In the ramp generator
   d) In the flasher circuit

5. Working of astable multivibrator using op amp.

6. What is an operational amplifier (op-amp)
   It is a multistage, very high gain, direct-couple negative amplifier that uses voltage shunt f/b to provide a stabilized voltage gain

7. characteristics of Ideal op amp

8. What is voltage transfer curve of an op-amp
   The curve drawn b/w o/p voltage and i/p differential voltage for an op amp keeping voltage gain A constant.

9. What are differential gain and common mode gai. of a differential amplifier ?

When the difference of two i/ps applied to the two terminals of a differential amplifier is amplified, the resultant gain is termed as differential gain

But when the two i/p terminals are connected to the same i/p source then the gain established by the differential amplifier is called common mode gain

10. Define CMRR

11. Mathematical expression for CMRR

12. Why does an opamp have high CMRR

High CMRR ensures that the common mode sgls such as noise are rejected successfully and the o/p voltage is $\propto$ (proportional) to the differential i/p voltage

13. Why open loop opamp configurations are not used in linear applications.

When an opamp is operated in the open loop configuration the o/p either goes to positive saturation or negative saturation levels & thus clips the o/p above these levels

14. Define offset voltage as applied to an opamp

15. Define slew rate.

16. Advantage of op amp

Low cost, small size, high reliability, temp. stability & low value of offset voltage & ct.

17) What is μA in μA741IC

18. What about the phase shift of both the i/p terminals of an opamp

19. Block diagram of a typical opamp and explain.

20. Basic block of an opamp differential amplifier

21. Draw the schematic symbol of an opamp.

22. Draw the Equivalent circuit of an opamp.

23. Why an ideal opamp is a voltage controlled device
Its i/p resistance Rin is infinite. It means that the i/p ct (ct drawn from the source) is zero and so it does not load the source.

24. Limitations of open loop op amp

25. D.C characteristics of op amp
Input offset voltage V_{io} (741C) ± 2mV
Input Bias current
Input offset current
Thermal drift

26. A C characteristics of opamp
Gain Bandwidth product
Rise time
slew rate
power supply Rejection Ratio.

27. Define slew rate

28. What kind of negative f/b is present in non inverting opamp
Negative voltage series feed back

29. What is a voltage follower ckt
What is a voltage follower amplifier

30. Advantages of voltage follower amplifier
extremely low o/p impedance, high i/p impedance, and is, ∴, an ideal ckt unity transmission gain
device for use as a buffer amplifier

31. In what way is the voltage follower a special case of the non inverting amplifier

If feed back resistor is made zero in a non inverting amp: ckt, voltage follower is obtain.

32. What is the difference b/w balanced and unbalanced o/p?

When the o/p voltage is measured b/w two collectors, the configuration is referred as a balanced o/p and if it is measured across any one collector w.r.t gnd, the configuration is then said to be unbalanced

33. What is the use of difference amplifier stage in an op amp

The main purpose of the diff: amp: stage is to provide high gain to the difference mode sgl and cancel the common mode sgl ie it must hav high CMRR

34. concept of virtual gnd

35. Linear applications of opamp

Adder, subtractor, Instrumentation amp

36. Non linear applications of opamp

clipper, clamper, rectifier, peak detector, multiplier etc

37. What does 74 LS refers to

74 refers to IC which can be used for commercial purpose LS → Low power schottky

Ex No: 2

Monostable Multivibrator

Aim:

To design and set up a monostable multivibrator for a given time period of 1ms.

Components Required

Sl.No	Components	Specification	Qty

Design

Let $T = RC \ln\left[\frac{1}{(1-\beta)}\right]$

Let $R_2 = 10k\Omega$, $\beta = 0.5 = \frac{R_2}{R_1+R_2} = \frac{10\times10^3}{10\times10^3+R_1}$

$\therefore R_1 = 10k\Omega$

Let $C = 0.1\mu f$ $T = 1ms$

$T = 0.693\,RC$

$R_f = \frac{10^{-3}}{0.693\times0.1\times10^{-6}} = 14.420k \approx 15k\Omega$

For differentiator

$R_d C_d = 0.0016\,T$ $T = 5ms$

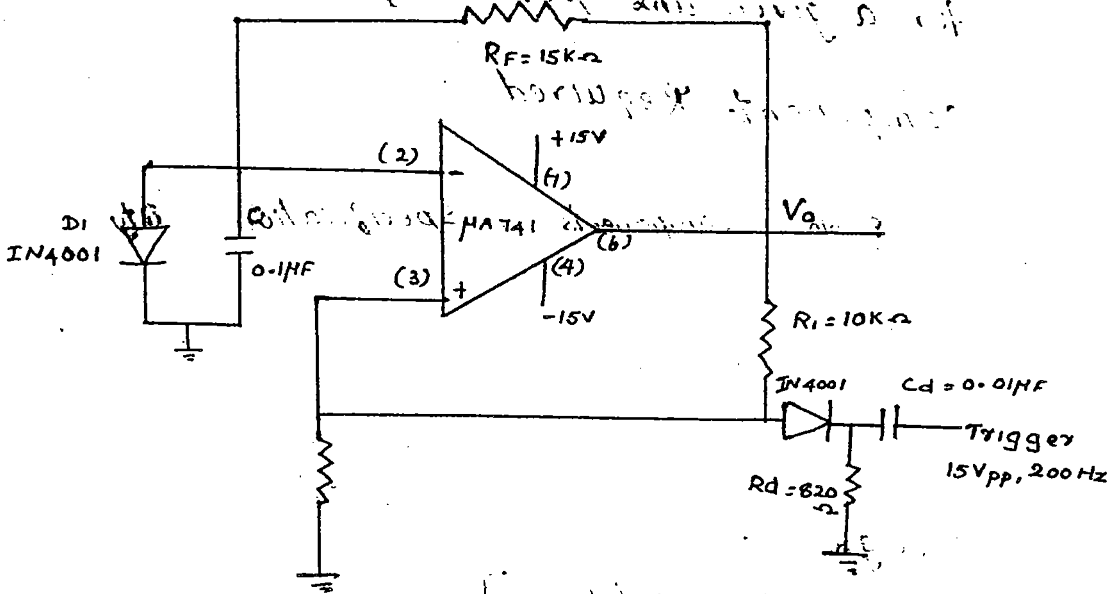
$C_d = 0.01\mu f$

$R = \frac{0.0016\times5\times10^{-3}}{0.01\times10^{-6}} = 800\Omega \approx 820\Omega$

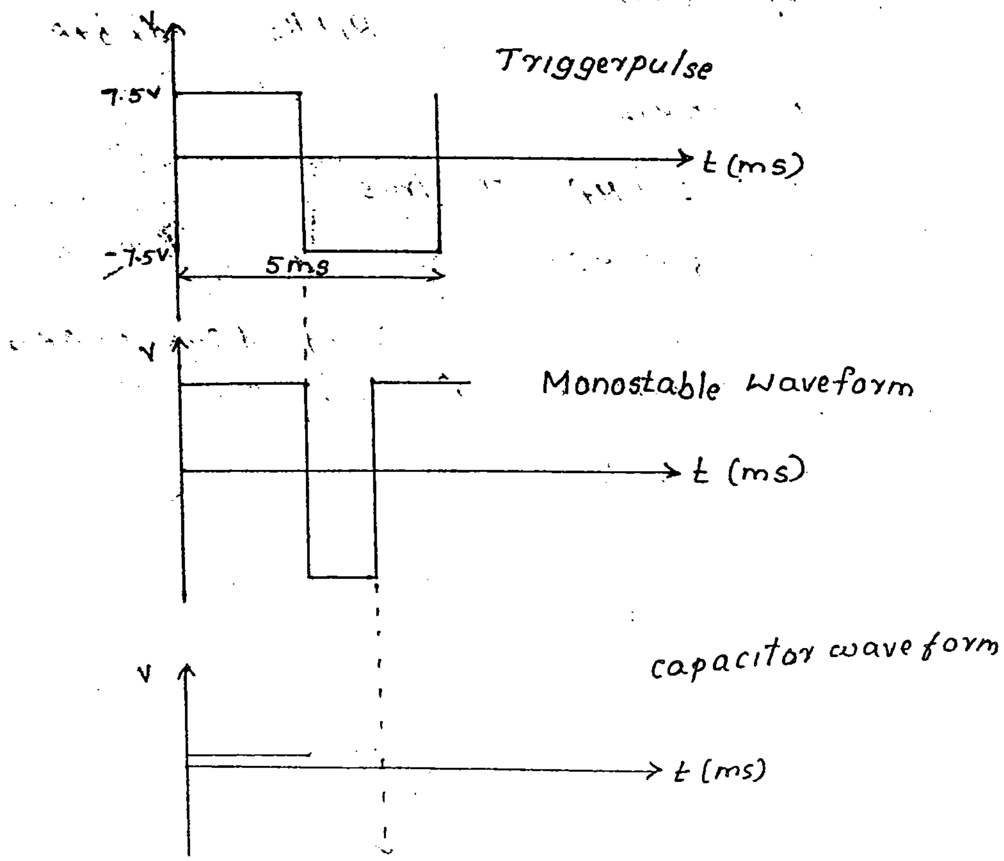
Procedure:-

As per Expt No: 1

ckt diagram



waveforms



Viva Questions

1. Why are monostable multivibrators sometimes called the one-shot multivibrators
   This generate one o/p pulse for every trigg pulse, so it is called as one shot multivibrators.

2. Why monostable multivibrator (MMV) is called a delay ckt
   Since the MMV generates a fast transition at a predetermined time T after the i/p trigger.

3. A monostable multivibrator has only one stable state.

4. Which type of f/b is used in multivibrator
   It is essentially an amplifier with 100% +ve f/b

5. Is the triggering given is edge type or level type.
   Edge type and it is trailing edge.

6. What is an electric switch
   An electric switch is a device that can turn on o off current in an electrical circuit.

7. What is meant by ~~electrt~~ switching circuit
   Switching ckt is that ckt which can turn on o off ct in an electrical ckt. The switching ckt essentially consists of a switch and an associated circuitry.

8. What is meant by delay time
   The time interval b/w the instant of the application of i/p pulse and the o/p (collector ct) to attain 10% of its max value. It is denoted

9. What is meant by fall time
   It is defined as the time required for o/p to go from 90% to 10% of its max value. It is

denoted by t_f.

10. How a monostable Multivibrator ckt can be made from an astable Multivibrator ckt

by replacing one R-C timing ckt by dc voltage divider.

11. How do square wave generators differ from pulse generators

Square wave generators can be considered to be a special class of pulse generators. If the pulse train has the property of being "ON" 50% of the time period and "off" 50% of the time period, the waveform generated is called the square wave & the generators producing such waveforms are called the square wave generators

12. Define periodic sgl

periodic signal is that which repeats itself at regular intervals of time.

13. What is meant by a time period of a periodic sg.

is defined as the time duration in seconds b/w the start of one pulse and start of nxt pulse

14. What are saturation voltages

The maximum and minimum voltage levels at which the o/p of an op-amp can assume based upon given power supply.

15. What is the importance of Turn ON and turn OFF t.

These are important in deciding the maximum switching freq of the tr. In order to operate the tr at a high freq, the turn ON & turn OFF times should be as short as possible

16. What are the applications of Monostable multivib

a) As a timer

b) It can be used to gate another ckt

c) As a delay generator

17. Compare Astable and Monostable Multivibrator

Astable Multivibrator	Monostable Multivibrator
a) There are no stable states of o/p	There is only one stable state of the o/p
b) Trigger i/p is not necessary for changing the state of the o/p	Trigger pulse is required for changing the state of o/p
c) Used as rectangular, square wave or ramp generator	used as timer
d) Number of quasi stable states is 2	No: of quasi stable states is 1

18. Transistor in cut off region → open switch

Transistor in saturation → closed switch

19. Other names of Monostable Multivibrator

Since when it is triggered, the ckt returns to its steady state after time T, it is known as one shot or a single cycle or a single step ckt or a univibrator. Since it generates a rectangular waveform, it can be used to gate other ckt. It is also called as a gating circuit

20. Comparison of Multivibrator and oscillator

Multivibrator	oscillator
a) produce only a square or rectangular waveform	a) square or sinusoidal waveform
b) f/b is not used	b) +ve feed back is used
c) Ttr acts as switches	c) Active region.

Ex No: 3

RC Phase shift Oscillator

Aim:-

To design and set up a RC phase shift oscillator of frequency 1KHz

Components Required :-

Sl No	components	specification	Qty

Design

$$f_0 = \frac{1}{2\pi RC\sqrt{6}}$$

Take $C = 0.1\mu f$ $\qquad f_0 = 1KHz$

$10^3 = 10^6/(2 \times 3.14 \times R \times 0.1 \times \sqrt{6})$

$R = 10^6/(10^3 \times 2 \times 3.14 \times 0.1 \times \sqrt{6})$

$R = 680\Omega$

$R_1 \geq 10\ R$

$\therefore\ R_1 = 10 \times 680$

$= 6.8k\Omega$

Required gain $\left|\frac{R_f}{R_1}\right| = 29$

Take $R_1 = 6.8k\Omega$

$R_f = 29 \times 6.8$

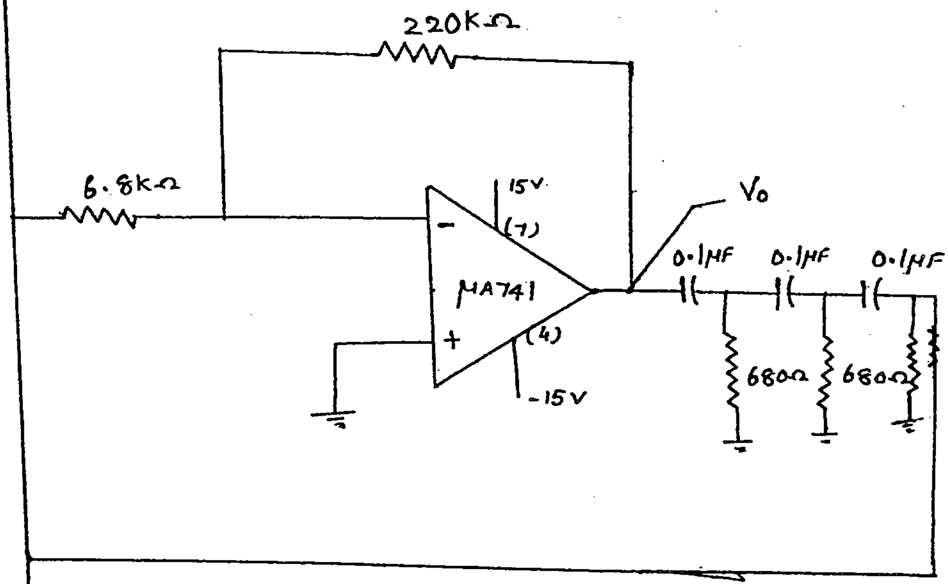
$= 197.2$

$\simeq 220k\Omega$

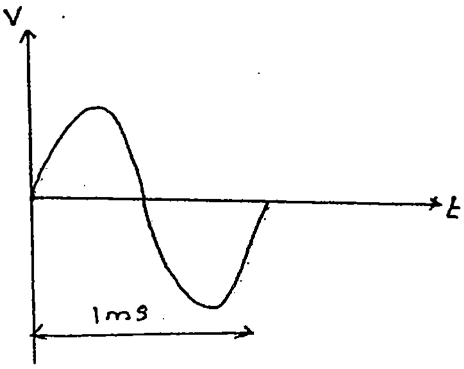
Procedure :-

As per Ex: No 1

ckt diagram :-



waveform :-



Viva Questions :-

1. What is an oscillator

A ckt which generates an ac o/p sgl of very high frequency without requiring any externally applied i/p sgl.

OR

... into very high

frequency ac energy.

2. What is Barkhausen criterion.

i) The loop gain of the ckt must be ≥ 1

ii) The phase shift around the ckt must be zero.

3. What is the initial condition for oscillation to start

loop gain $A\beta \geq 1$

4. Explain why positive feedback and not negative feedback is necessary to produce oscillations.

With negative f/b factor $A\beta$ becomes less than unity, $A\beta V_{in}$ less than V_{in} + therefore o/p sgl will die out, while with positive feedback $A\beta$ exceeds unity, $A\beta V_{in}$ exceeds V_{in} + oscillations are produced.

5. Two categories of oscillators

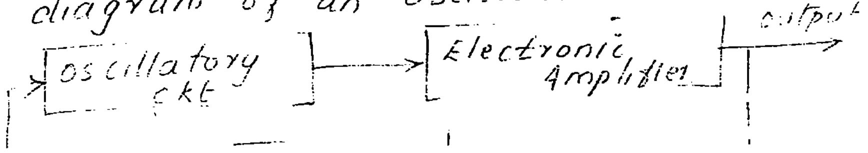
Harmonic oscillators, Relaxation Oscillators

6. Differentiate ~~Harmonic~~ + Relaxation oscillators

Harmonic Oscillators	Relaxation Oscillators
a) Energy always flows in one direction (from active-passive components)	a) The energy is exchanged b/w the active + passive componen
b) Frequency of oscillations is determined by feedback path	b) Frequency is determined by time constants - specially the charge + discharge time consta during exchange of energy
c) This can develop low distortion sinusoidal o/p waveforms	c) It can only generate non sinusoidal waveforms such as square, Δular, sawtooth

7. Three elements of oscillator $\rightarrow$ Oscillatory ckt or tank ckt, Amplifier, feed back n/w.

8. Block diagram of an oscillator



9. Most widely used LC oscillators
Hartley and Colpitts oscillators [10kHz - 100MHz]

10. Why such oscillators [LC] are not suitable for generating low frequency sinusoidal o/p.
This is due to the fact that the components required in construction of low freq^n LC ckts are too bulky & heavy so RC oscillators are used

11. Two common RC oscillators
Wien bridge & phase shift

~~12. How does Hartley oscillator differ~~

12. Why crystal oscillator used in comm:- txers & rxers
b'coz of their greater frequency stability

13. Mention the most commonly used oscillators and their approximate frequency ranges.

Type of oscillator	Frequency Ranges
1) Wien bridge oscillator	1Hz - 1MHz
2) phase shift oscillator	1Hz - 10MHz
3) Hartley oscillator	10kHz - 100MHz
4) Colpitts oscillator	10kHz - 100MHz

14) With wave form define oscillations die out, oscillations build up, oscillations of constant amplitude

15. Tank circuit consists of
a) Inductive coil of Inductance 'L'
b) capacitor of capacitance 'C'.

16. Applications of sinusoidal oscillators.
refer "Applied Electronics" by R.S SEDHA

17. Explain oscillatory ckt.
refer R.S SEDHA

18. What is the basic principle of RC oscillators

19. In a RC phase shift oscillator, the expression for frequency of oscillation is

$$f = \frac{1}{2\pi RC\sqrt{6}}$$

COLPITTS OSCILLATOR

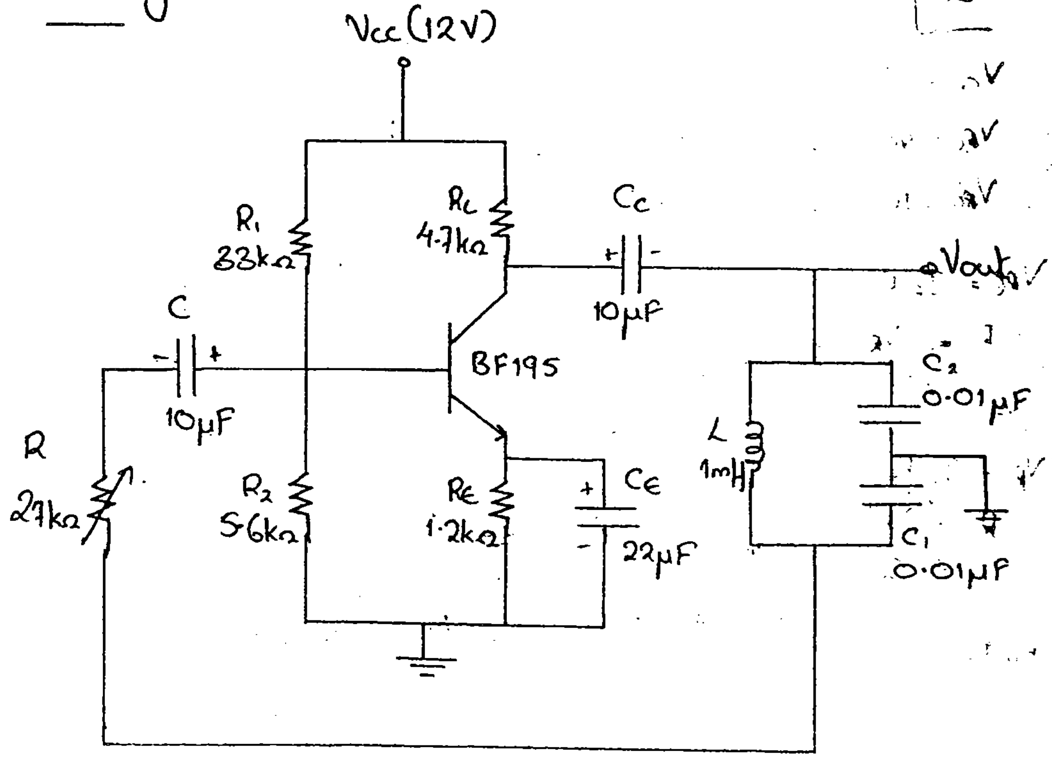
AIM.

To design and setup a Colpitts oscillator of frequency 70kHz.

Components Required.

Sl.No.	Components	Specification	Quantity
1	Transistor	BF 195	1
2	Resistor	4.7kΩ, 33kΩ, 5.6kΩ, 1.2kΩ, 27kΩ	1 each
3	Capacitor	22μF, 0.01μF	1, 2
4	Inductor	1mH	

Circuit Diagram

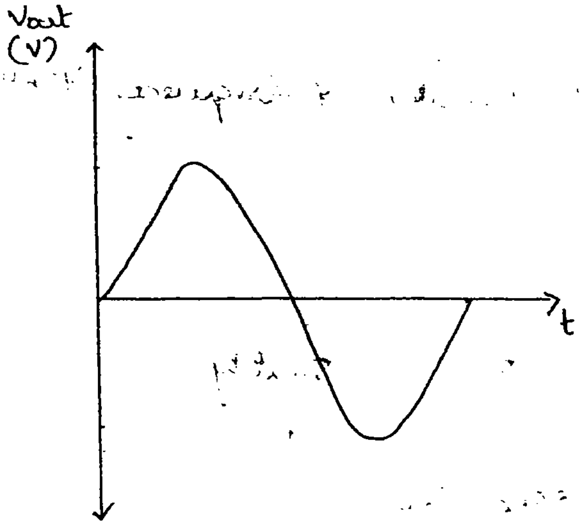


Output waveform

Scale

x axis : 1 unit =

y axis : 1 unit =



Design

$V_{CC} = 12V$, $I_C = 1mA$, $\beta = 60$, $S = 5$

DC Biasing conditions.

$V_{CE} = 50\%$ of $V_{CC} = 6V$

$V_{RC} = 40\%$ of $V_{CC} = 4.8V$

$V_{RE} = 10\%$ of $V_{CC} = 1.2V$

$V_{RE} = I_E R_E$

$R_E = V_{RE}/I_E = \frac{1.2}{1m} = \underline{\underline{1.2k\Omega}}$ $(\because I_E \approx I_C)$

$V_{RC} = I_C R_C$

$R_C = \frac{V_{RC}}{I_C} = \frac{4.8}{1m} = 4.8k\Omega \approx \underline{\underline{4.7k\Omega}}$ (std)

Stability Factor, $S = \frac{(1+\beta)(1 + R_B/R_E)}{1+\beta + R_B/R_E}$

$$5 = \frac{61\left(1 + \frac{R_B}{1200}\right)}{61 + R_B/1200}$$

$R_B = R_1 \| R_2$

$$R_B = \frac{R_1 R_2}{R_1 + R_2} \quad -(1)$$

KVL in i/p loop,

$$V_{R_2} = V_{BE} + V_{RE} = 0.6 + 1.2 = 1.8\,V$$

voltage divider rule,

$$V_{R_2} = V_{CC} \cdot \frac{R_2}{R_1 + R_2}$$

$$\text{ie } \frac{R_2}{R_1 + R_2} = \frac{V_{R_2}}{V_{CC}} = \frac{1.8}{12} = 0.15$$

using (1),

$$5232.68 = R_1 \times 0.15$$

$$R_1 \approx 34884\,\Omega \approx \underline{\underline{33\,k\Omega}} \text{ (std)}$$

$$R_2 = \underline{\underline{5.6\,k\Omega}}$$

Design of Bypass Capacitor

reactance, $X_{CE} = \dfrac{1}{2\pi f \cdot C_E}$ = $\quad X_{CE} = \dfrac{R_E}{10} = \dfrac{1.2k}{10} = 120\,\Omega$

Let $f = 50\,Hz$

$$\therefore C_E = \frac{1}{2\pi f \times 120} = 26\,\mu F \approx 22\,\mu F \text{ (std)}$$

Design of feedback ckt

Assume $C_1 = C_2 = 0.01\,\mu F$, $f = 70\,kHz$.

$$f = \frac{1}{2\pi \sqrt{L\,C_{eq}}} \quad -(2)$$

$$C_{eq} = \frac{C_1 C_2}{C_1 + C_2} = 5 \times 10^{-9}\,F$$

sub in (2),

$$70 \times 10^3 = \frac{1}{\quad}$$

$\therefore L = 1.035 \times 10^{-3} H$

Design of Coupling Capacitor

$f = 50Hz$

$X_{cc} = \frac{1}{2\pi f C_c}$, $X_{cc} = \frac{R_c}{10} = \frac{4.7k}{10} = 470\Omega$

$C_c = \frac{1}{2\pi \times 50 \times 470\Omega} = 6.78\mu F \approx 10\mu F$ (std)

Procedure

1) Check all components and connect as shown in the ckt diagram

2) Obtain the waveform

3) Note amplitude + time period.

Exp No. 5

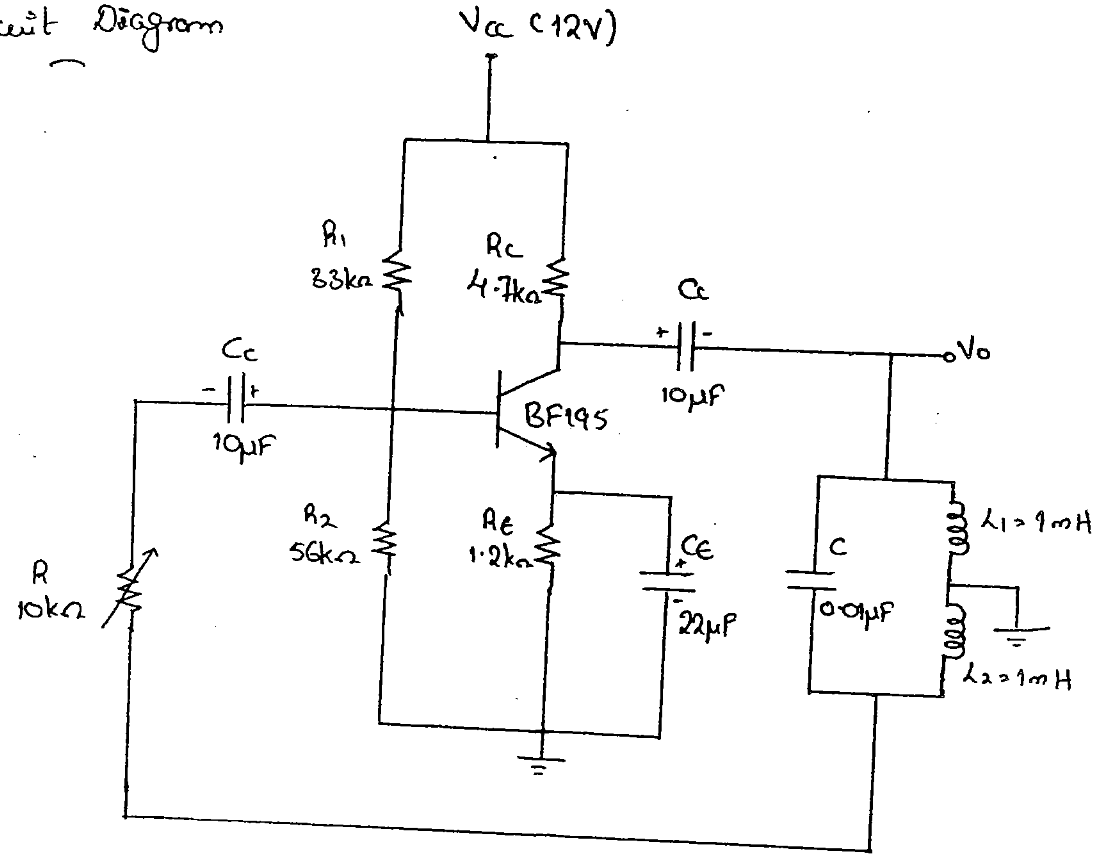
Hartley Oscillator

Aim

To design and implement Hartley oscillator for a frequency of 35 kHz.

Components Required

Circuit Diagram



Design.

Same as that of Colpitts oscillator

Design of Feedback ckt

$f = 35kHz$, Assume $C = 0.01\mu F$.

$$f = \frac{1}{2\pi\sqrt{L_{eq}C}} = 35\times10^3\ Hz$$

$\therefore L_{eq} = 2.069mH \approx 2mH$

$L_{eq} = L_1 + L_2 = 2mH$

1. Working of Hartley oscillator

refer R.S. SEDHA page 572

Electronic Device & ckts [illegible] Page 427

2. Working of Tank circuit

3. How 180° is produced by CE configuration

4. Use of R_E and C_E

5. Name of R_E and C_E

6. Use of C_C, C_B, R_1 & R_2

7. Frequency of oscillations of Hartley oscillator

8. Frequency of oscillation of Colpitts oscillator

9 Barkhausen criteria

10 How does Hartley oscillator differ from Colpitts oscillator in construction

Hartley oscillator ckt is similar to Colpitts oscillator except that phase shift network consist of two inductors and one capacitor instead of two capacitors and one inductor

11. Why are L-C resonant ckts impractical at audio frequencies.

LC resonant ckts are impractical at audio frequencies bcoz components required in their construction for low frequency operation are too bulk and heavy and expensive.

12 What is meant by frequency stability of an oscilla

Measure of its ability to maintain a constan frequency over a long time interval.

13. How does an oscillator operate without an i/p sg.

We have to apply some i/p voltage, so that o/p is produced & part of it is fed back and as this f/b is sufficient to satisfy the condition $|A\beta| = 1$, the oscillations are sustained. But we do not apply any i/p voltage to start the oscillations.

Due to random movement of e's inside any electronic device such as resistor, a voltage is generated which is called noise voltage. This noise voltage is amplified by the amplifier and fed back. If the Barkhausen criterion is satisfied then, sustained oscillations will be obtained at the o/p. Thus noise voltage acts as the starting voltage and oscillators can operate without an i/p sg.

14. What happens when $|A\beta|$ changes

when $|A\beta| = 1$ → constant amplitude sustained oscillations of constant amplitude.

when $|A\beta| < 1$ → Exponentially decaying oscillations

when $|A\beta| > 1$ → Exponentially increasing oscillation.

15. Differentiate damped and undamped oscillations

16. The essentials of a transistor oscillator

a) The oscillatory ckt

$$f = \frac{1}{2\pi\sqrt{LC}}$$

b) The transistor amplifier

c) The feed back ckt

17) Hartley and Colpitts oscillator ckts do not have high frequency stability due to

1) The collector base internal capacitance affects the value of capacitance in the ckt. This will changes the frequency of oscillations

2) The transistor parameters depend on the temp. Due to change in their values, the freq of oscillations will change.

18) How frequency stability can improve

1) Use voltage regulators to keep the supply voltage constant.

2) Use a special type of oscillator called Clapp oscillator

3) Use a temp: stabilized chamber to enclose the oscillator ckt. The temperature of chamber is maintained constant at the desired level. This will avoid frequency changes due to drift in temperature

19) Advantages of colpitts oscillator

1) Simple construction

2) It is possible to obtain oscillations at very high frequencies

20) Drawbacks of colpitts oscillator

1) It is difficult to adjust the feedback as it demands change in capacitor values

2) Poor frequency stability.

21) Applications → high frequency Generator

22) Advantages of Hartley Oscillator

1) It is easy to tune

2) It can operate over a wide frequency range typically from few Hz to several MHz

3) It is easy to change the frequency by means of a variable capacitor

23) Applications of Hartley Oscillator

1) It is used as local oscillator in radio & TV receiver

2) In the function generators

3) In RF sources

24) Drawback - poor frequency stability

25) How does a signal generator differ from an ordinary oscillator

The signal generator like an ordinary oscillator is a source of sinusoidal sgl but it is also capable of modulating its sinusoidal o/p sgl with other sgls.

AMPLITUDE MODULATION

AIM

To design and setup an AM generator and measure the modulation index from the observed o/p waveforms.

Design

$V_{CC} = 12V$, $I_C = 1mA$ $h_{fe} = 67$

Design of R_E

$V_{RE} = 10\%$ of $V_{cc} = 1.2V$

$I_B = \frac{I_C}{h_{fe}} = \frac{1mA}{67} = 15\mu A$

$R_E = \frac{V_{RE}}{I_C} = \underline{\underline{1.2k\Omega}}$

Design of R_1 & R_2

$10 I_B$ flows through R_1 & $9 I_B$ flows through R_2

KVL to base loop,

$V_{R_2} = V_{RE} + V_{BE(sat)} = 1.2 + 0.6 = 1.8V$

~~voltage divider rule,~~ $V_{R_1} = V_{cc} - V_{R_2} = 12 - 1.8 = 10.2V$

$R_1 = \frac{V_{R_1}}{10 I_B} = \frac{10.2}{10 \times 15 \times 10^{-6}} = \underline{\underline{68k\Omega}}$ (std)

$R_2 = \frac{V_{R_2}}{9 I_B} = 13.3k\Omega \approx \underline{\underline{12k\Omega}}$ (std)

Design of Bypass Capacitor C_E

operating frequency $= 455kHz$

$X_{CE} \le \frac{R_E}{10} \Rightarrow \frac{1.2k}{10} = 120\Omega$

$C_E = \frac{1}{2\pi \times 455 \times 10^3 \times 120} = 0.003\mu F \approx \underset{(std)}{10\mu F}$ $\left(\because X_{CE} = \frac{1}{2\pi f C_E}\right)$

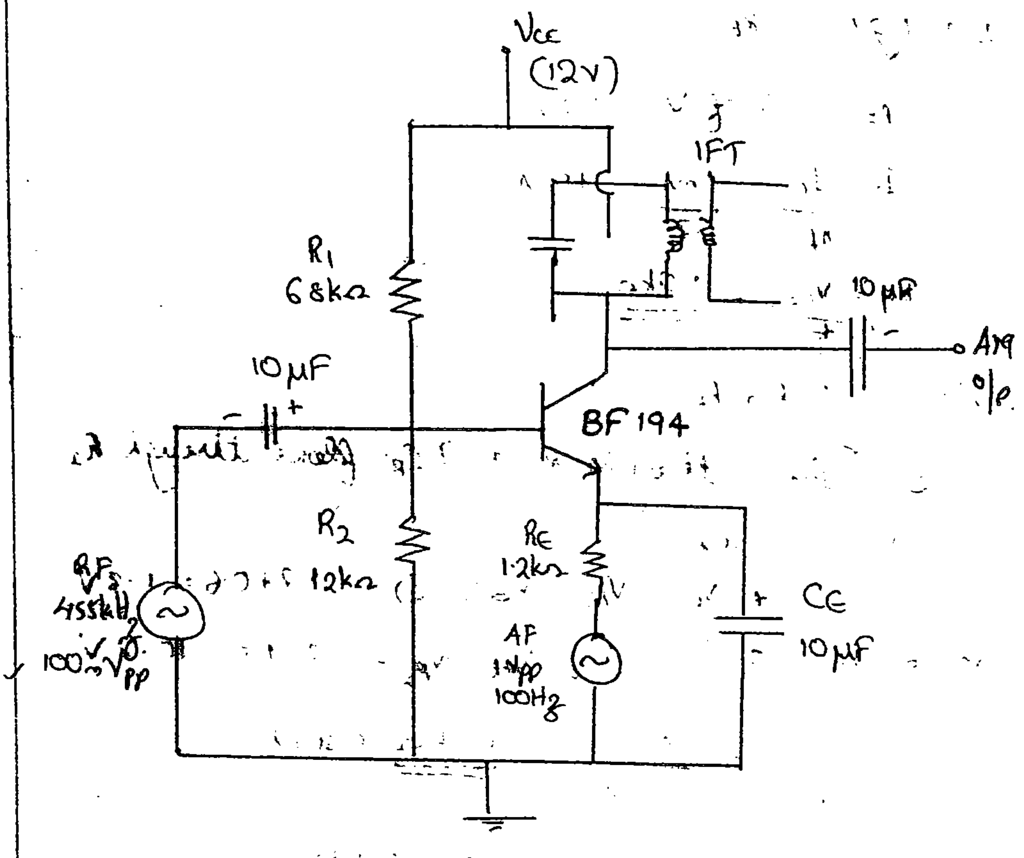
procedure

1) Give 455kHz i/p at transistor base

2) IFT should be tuned to get maximum gain at 455kHz

3) Apply AF i/p at emitter

4) Modulation index, $m = \dfrac{V_{max} - V_{min}}{V_{max} + V_{min}}$



Draw the expected waveforms

— (message sig, carrier, AM wave)

Amplitude Shift Keying

Aim :- To design and set up amplitude Shift keying

Components Required

SLNO	components	specification	quantity

Design

Let $f_o = 1KHz$

$$f_o = \frac{1}{2\pi RC}$$

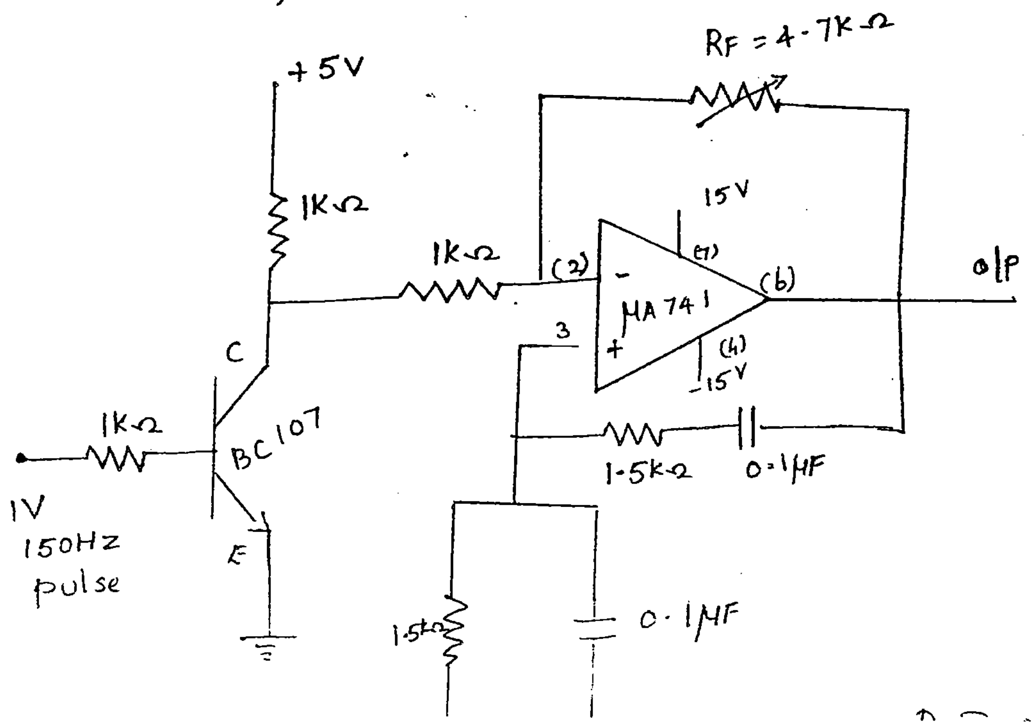
Let $C = 0.1\mu F$

$$R = \frac{1}{2\pi f_o C} = \frac{1}{2 \times 3.14 \times 10^3 \times 0.1 \times 10^{-6}} = 1.5k\Omega$$

$$Gain = 1 + \frac{R_f}{R_1} = 3$$

Let $R_1 = 1k\Omega$

then $R_f \approx 2.2 k\Omega$ [use $4.7 k\Omega$ pot]



Draw the Expected Waveform

8
21
24

Amplitude Modulation

1. Block diagram explanation of communication
2. Define Modulation.
3. What is meant by carrier wave
4. Define Modulating wave
5. Need for Modulation
6. Types of Modulation.
7. Define continuous wave Modulation

   When the carrier wave is continuous in nature the modulation process is called this or analog modn. AM and Angle Modulation [FM & PM]
8. What is Pulse Modulation

   When the carrier wave is a pulse type wave for. the modulation process is pulse Modn. In this, the carrier consists of a periodic sequence of rectangular pulses. Pulse Modulation may be of an analog or digital type.
9. What is Analog pulse Modn: & eg
10. What is digital pulse Modn: & eg
11. Define AM, FM, PM
12. General expression for AM & define each term
13. Modulation Index / degree of modn: & its value
14. Modn: index in different form
15. Explain amplitude modulated waves for differ values of m

11 Importance of m

17. power relation in AM

18. Limitations of AM

Refer J B Gupta page 445

19. Define FM

20. Define frequency modulation index m_f

21. What is frequency deviation

22. What is carrier swing

The total variation in frequency from min to max value and it is twice the frequency deviation

23. compare AM & FM.

24. Drawbacks of FM

25. comparison b/w FM & PM

26. What is the BW of AM wave

27. What is the current relationship for AM wave

28. What is FM Index

The ratio of frequency deviation to modulation frequency

29. What is demodulation

30. What is the maximum value of m for distortion free txion → ideally max: value of m is 1

31. How do we vary the amplitude of sidebands

By varying the m, if carrier amplitude is constant b'coz amplitude of each sideband = $\frac{m_a V_c}{2}$

32. What is the effect of m on the carrier power in AM

No effect, P_c remains constant independent of m

33. Why is an AM sgl get severely affected due to noise

B'coz the infn is contained in AM variations

42 What is sampling Theorem

43 What is PAM, PTM, P

44. What is the difference b/w pulse analog modn. and other analog modn. s/ms

In analog pulse modulation s/m, the carrier is a train of pulse & either amplitude or width or position of this carrier is varied in proportion to the amplitude of message sgl

45 How to recover the original modulating sgl back from the sampled sgl

46 Merits & Demerits of PAM, PPM, PWM

47. How do you transmit information using PWM

48 Why is PAM not used in practice

As PAM does not have a high noise immunity

49 What is the minimum bandwidth required to transmit a PAM sgl

50 Why is the PAM sgl contaminated by noise

51. What is Quantization & its types

52 What is Companding

53

1) This semester portions

2) Working of each experiments

of an AM wave, and the noise modifies the amplitude of the AM sgl. Thus due to noise the info. will be contaminated.

34 What is Exion BW for FM

For n sidebands the BW of FM is given by

$BW = 2nf_m$ Hz.

35. How to vary the deviation

Deviation is $\propto$ to the instantaneous value of the modulating voltage, so by changing the amp. of modulating sgl, it is possible to change the deviation.

36. What is the role of modulating frequency fm in frequency modulation.

The rate at which the carrier frequency varies from its center value is equal to the modulating freq. So with ↑ in fm keeping the amplitude constant we will get the same freq. deviation at a faster rate

37 How to calculate the amplitudes of various sidebands in the spectrum of FM

The amplitude of sidebands depend on the J coefficients & the J coefficients in turn depend on modulation Index mf.

38 What is the effect of mf on the BW of FM

With ↑ in mf, the no: of sidebands having significant amplitude will also ↑es. This will ↑es the BW

39 What is sampling

40 What do you mean by Nyquist rate

41 What do you mean by sampling period(T_s) and

Pulse Width Modulation

Aim

To design and set up pulse width Modulation

Components Required

SL No	Components	Specification	Quantity

Design

Frequency $f = \dfrac{R_1}{4R_2R_3C} \doteq 1KHZ$

peak to peak output ramp $= \dfrac{2R_2 V_{sat}}{R_1}$

Let $V_{opp} = 5V$

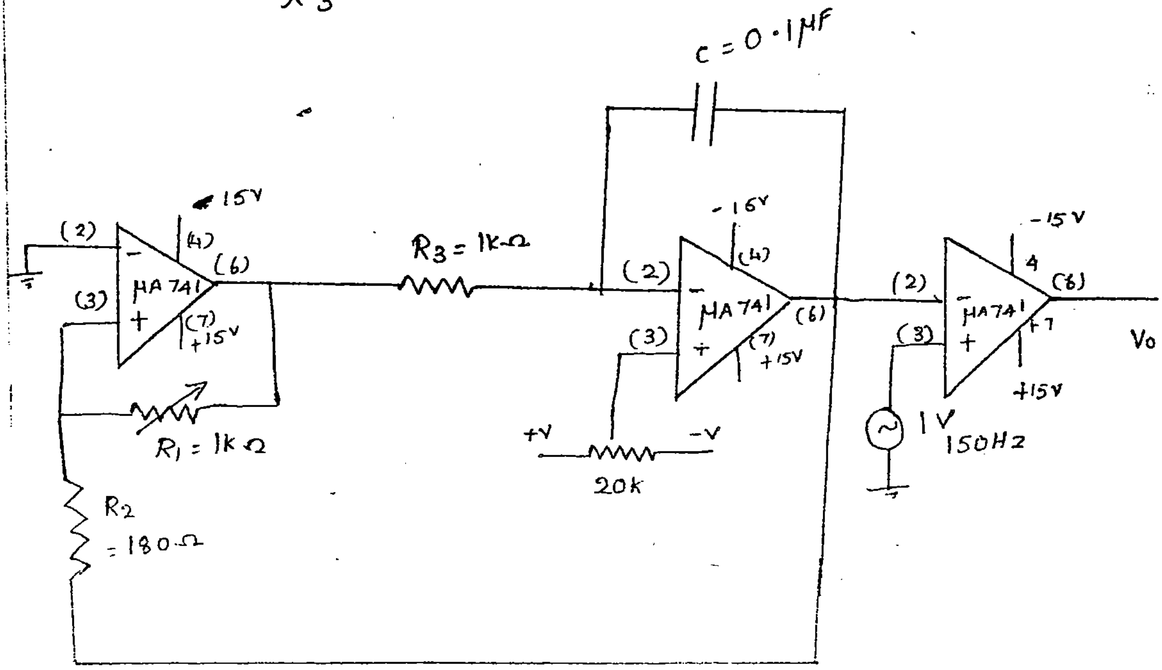
$V_{sat} = 13V$

$R_1 = 1k\Omega$

$R_2 = 180\Omega$

$C = 0.1\mu F$

$R_3 = 1k\Omega \simeq 12k\Omega$ (std)

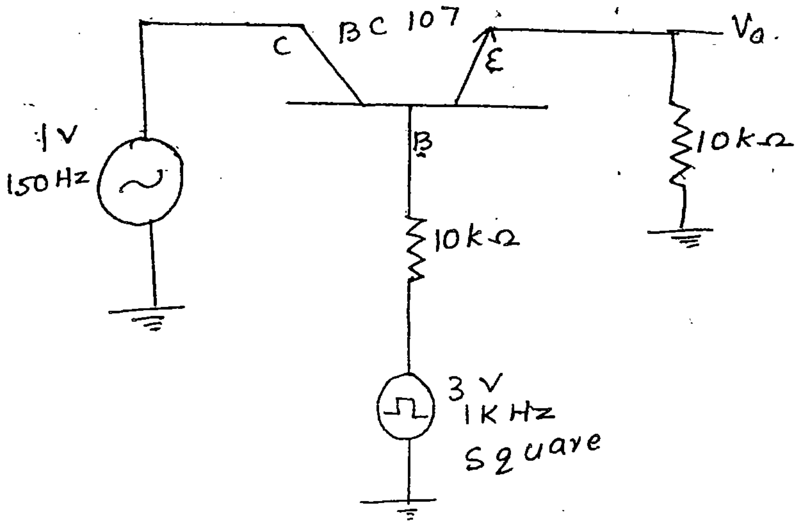


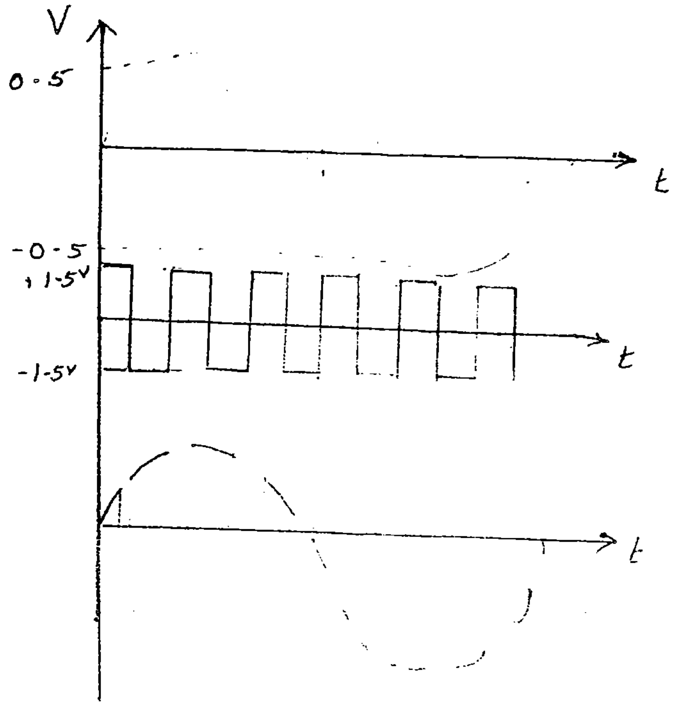
o/p waveform

Pulse Amplitude Modulation

Aim

To set up pulse Amplitude Modulation





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