7. SUBJECT DETAILS

7.6 ELECTRONIC CIRCUITS

7.6.1 Objective and Relevance

7.6.2 Scope

7.6.3 Prerequisites

7.6.4 Syllabus

- i. JNTU
- ii. GATE
- iii. IES

7.6.5 Suggested Books

7.6.6 Websites

7.6.7 Experts' Details

7.6.8 Journals

7.6.9 Findings and Developments

7.6.10 Session Plan

7.6.11 Students Seminar Topics

7.6.12 Question Bank

- i. JNTU
- ii. GATE
- iii. IES

7.6.13 Assignment Questions

7.6.1 OBJECTIVES AND RELEVANCE

In this subject, a major emphasis is laid on various types of amplifiers (single stage amplifier, multistage amplifier, feedback amplifier, power amplifier and tuned amplifier) and oscillators.

Almost all electronic equipments must include means for amplifying electrical signals. The subject of "Electronic Circuits" explains in detail how electrical signal is amplified. The various amplifiers that are going to be discussed include Single stage amplifiers, multistage amplifiers, Feedback amplifiers, power amplifiers and tuned amplifiers. The design of these amplifiers and its analysis will also be discussed.

7.6.2 SCOPE

The student will gain knowledge on various amplifiers i.e Designing amplifiers for the required specifications (single stage amplifier, multistage amplifier, feedback amplifier, power amplifier and tuned amplifier) and their analysis.

7.6.3 PREREQUISITES

Knowledge on semiconductor devices and network analysis is required.

7.6.4.1 JNTU SYLLABUS

UNIT-I

OBJECTIVE

It deals with Analysis of single stage amplifiers using simplified Hybrid model.

It also deals with the Effect of feedback and Analysis of the Feedback amplifier in all Topologies.

SYLLABUS

Single Stage Amplifiers Design and Analysis Review of CE, CB, CC & CS amplifiers-Classification of Amplifiers, Distortion in amplifiers-Approximate analysis, CE, CB, CC amplifiers comparison.

Feedback Amplifiers: Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics-Voltage series-Voltage shunt. Current series and Current shunt Feedback configurations-Simple problems.

UNIT- II

OBJECTIVE

It deals with the design of various multistage amplifiers of BJT, the determination of the frequency response and the bandwidth of various multistage amplifiers.

SYLLABUS

BJT & FET Frequency Response Logarithms-Decibels-General frequency consideration-Low frequency analysis-Low frequency response of BJT amplifiers-Low frequency response of FET amplifier-Miller effect capacitance-High frequency response of BJT amplifier-Square wave testing.

UNIT-III

OBJECTIVE

In this chapter we learn the operations and design of multivibrators and also we study diode clippers; transistor clippers and comparators.

SYLLABUS

MULTIVIBRATORS: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.

CLIPPERS AND CLAMPERS: Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, Applications of voltage comparators, Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem, Practical clamping circuits, Effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT- IV

OBJECTIVE

It deals with the design of various power amplifiers, determining efficiency, power output of various classes of power amplifiers and distortion resulted in power amplifiers. It also deals with the response of RC high pass and low pass circuits for non-sinusoidal waveforms

SYLLABUS

Large Signal Amplifiers: Class-A Power Amplifier, Maximum Value of Efficiency of Class-A Amplifier, Transformer coupled amplifier- Push Pull Amplifier-Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier)-Phase Inverters, Transistor Power Dissipation, Thermal Runway. Heat sinks.

Linear wave shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs.

UNIT- V
OBJECTIVE

In this chapter we study transistor switching and switching times

SYLLABUS
SWITCHING CHARACTERISTICS OF DEVICES: Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

7.6.4.2 GATE SYLLABUS

UNIT- I
Single stage Amplifier, Feed back Amplifiers
UNIT- II
Frequency Response of BJT Amplifier, Analysis at low and high frequencies.
UNIT- III
Clippers and Clampers
UNIT- IV
Large signal Amplifiers, Linear wave shaping.
UNIT- V
Not Applicable

7.6.4.3 IES SYLLABUS

UNIT- I
Not Applicable

UNIT- II
Not Applicable

UNIT- III
Not Applicable

UNIT- IV
Not Applicable

UNIT- V
Not Applicable

UNIT- VI
Not Applicable

UNIT- VII

Not Applicable

UNIT- VIII

Not Applicable

7.6.5 SUGGESTED BOOKS

Text Books

T1. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nasheisky, 9th Ed, Pearson Edu. 2007.

T2. Electronic Devices and Circuits by S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, 2nd Edition, Tata McGraw Hill Companies, 2008.

T3. Solid State Pulse Circuits by David A. Bell, 4th Edition, Prentice Hall of India.

Reference Books

R1. Introductory Electronic Devices and Circuits (Conventional flow version)-Robert T.Paynter, 7th Ed, PEI, 2009.

R2. Electronic Devices and Circuits, Anil K. Maini, Varsha Agarwal, 1st Edition, Wiley.

R3. Pulse, Digital & Switching Waveforms by Jacob Milliman, Harbert Taub and Mothiki S Prakash Rao, 2nd Edition, Tata McGraw Hill Companies, 2008.

7.6.6 WEBSITES

1. Nptel.iitm.ac.in
2. www.amiestudy.com
3. www.eetasia.com
4. forum.jntuworld.com
5. www.scribd.edu

7.6.7 EXPERTS' DETAILS

INTERNATIONAL

1. Roger W.Brockett

   Harvard School of Engineering

   Maxwell Dworkin 345

   brockett@hrl.harvard.edu

2. Amin arbabian

   Stanford University

   arbabian@stanford.edu

NATIONAL

1. Prof. Amitava Das Gupta
   Indian Institute of Technology,
   Chennai
   adg@iitm.ac.in

2. Prof.Anil Mahanta
   Professor,
   Indian Institute of Technology,
   Guwahati,
   Email: anilm@iitg.ernet.in

REGIONAL

1. Dr. Lakshmi
   Associate Professor
   NIT Warangal
   Email: ece_hod@nitw.ac.in

2. Dr. Ashok Kumar Das
   Associate Professor
   IIIT Hyderabad
   Email: ashok.das@iiit.ac.in

7.6.8 JOURNALS

INTERNATIONAL

1. IEEE Transactions of Electron Devices.
2. Circuits and systems Magazine IEEE
3. Power Electronics IEEE

NATIONAL

1. Electronics and Telecommunication Engineering
2. Electronics Marker Magazine.
3. Electronics for you

7.6.9 FINDINGS AND DEVELOPMENTS

1. Series connection designs for Dye solar devices cell modules , F. Giordano, E.Petro lati T.M. Brown, A. Reale and A.Di. Carlo, IEEE Transaction on Electron Devices, Vol. 58, No.8, IETDAI, August 2011.
2. Complementary Ring OSC exclusively prepared by means of Gravure and Flexographic printing, H.Kempa, M. Hambseh, K. Renter, M.Stanel.
3. A Darlington, - Enhanced CMOS Oscillator Architecture, T.A. Lehtonen, P. Ruippo, T. Keitannieni and N.T. Chamov, IEEE Transaction on circuits and systems, 1:Regular paper ,Vol.59, No.1, Jan 2012.
4. Distortion modeling of feedback Two stage amplifier compensated with Miller capacitor and Nulling Resistor, Y. Miao and Y. Zhang, IEEE Transaction on circuits and systems, 1: Regular paper ,Vol.59, No.1, Jan 2012.

7.2.10 SESSION PLAN

Lecture No.	Learning Objectives	Topics to be covered	Text Books/ Reference Books
UNIT I SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS, FEED BACK AMPLIFIERS			
1	Introduction	Review of Transistor – BJT & FET CE, CB, CC and CS amplifiers	T1: 5.3 – 5.8, 10.1 – 10.3 R1: 3.5 - 3.7, 5.2,5.3
2	To study Classification and Distortion	Classification of Amplifiers, Distortion in Amplifiers	T1: 12.1 & 12.2 R3: 14.1 & 14.2
3	To study simplified Hybrid Model	Two-port network, H-Parameter, Hybrid model	R3: 10.4,10.5 & 10.6
4		Approximate analysis of CE amplifier	
5	To Study the approximate analysis of Amplifiers	Analysis of CB and CC amplifiers	R3: 10.7

6	To study the comparisons of different amplifiers	Comparisons of CB, CC, and CE amplifiers	T1: 8.11 R3: 10.8 & 10.9
FEEDBACK AMPLIFIERS			
7	To study about feedback amplifiers	Concept of feedback	R1: 11.2 & 11.3
8	To study Types of Feedback amplifiers	Classification of feedback amplifiers	T1: 12.3 R1: 11.5,11.6 & 11.9
9	Characteristics of negative feedback amplifiers	General characteristic of negative feedback amplifiers	T1: 11.1
10	To study the analysis of negative feedback amplifiers	Effect of feedback on amplifier characteristics -Voltage Series	T1: 11.6 & 11.7
11		Effect of feedback on amplifier characteristics- Voltage Shunt	T1: 11.8
12	To study the analysis of negative feedback amplifiers	Effect of feedback on amplifier characteristics - Current Series	T1: 11.10
13		Effect of feedback on amplifier characteristics Current Shunt	T1: 11.11
UNIT – II BJT & FET FREQUENCY RESPONSE			
14	To understand the basics of frequency response.	Logarithms, decibels, general frequency considerations	R3: 12.1 – 12.3 R1: 12.1
15	To study the low frequency responses	Low frequency analysis of BJT amplifiers	T1: 12.7 R1: 12.2
16		Low frequency analysis of FET amplifiers	R1: 12.3
17	To study the Miller effect	Miller effect capacitance in low frequency response	
18	To study the high frequency response.	High frequency response of BJT amplifiers	R1: 12.4
19		Square wave testing	R1: 12.5
UNIT – III MULTIVIBRATORS, CLIPPERS AND CLAMPERS			
20	Analysis & Design of Bistable MV	Working of binary circuit	T1: 8.1
21		Working of fixed bias & self bias circuit	T1: 8.2,8.3

22		Effect of commutating capacitor, Symmetrical & Unsymmetrical triggering	T1: 8.4, 8.6
23	Design & analysis of monastable multivibrator	Working of collector coupled monastable multivibrator, wave form for stable quasi stable state, Emitter coupled monastable multivibrator working & W/F	T1: 9.3, 9.4
24		Triggering methods of MM	T1: 9.7
25	Design & analysis of Astable Multivibrator	Working of collector coupled astable multivibrator & its wave form	T1: 9.9
26		Working of emitter coupled astable multivibrator & its wave form	T1: 9.10
27	Schmitt trigger using transistor	Working of the circuit application	T1: 8.10
MID-1			
CLIPPERS AND CLAMPERS			
28	Diode Clipper	Introduction to clipping circuits working of diode clipper ,	T1: 5.1
29		Study of series and shunt cippler and their transfer characteristics , breakpoint	T1: 5.2
30	Transistor clipper, Transfer characteristics of emitter coupled clipper	Working of transistor clipper, cut-in region, equation for input resistance	T1: 5.3
31	clipping at two independent levels	working of double -diode clipper using PN and Zener diode	T1: 5.4
32	Comparators, applications of voltage Comparators	Introduction to comparators, working of basic diode comparators for ramp input, different applications of voltage	T1: 5.5,5.6,5.8

		comparators	
33	Clamping circuits	Clamping operation, and theorem, Practical clamping circuit,	T1: 5.9,6.0
34		Effect of diode characteristics on clamping voltage	T1: 6.1
UNIT:V LARGE SIGNAL AMPLIFIERS, LINEAR WAVE SHAPING			
35	Study of Large Signal Amplifiers	Classification, Class A Large Signal Amplifiers	T1: 18.1 R3: 18.1
36	To Study of Class A & Class B Amplifiers	Transformer Coupled Class A Audio Power Amplifier, B Amplifier	T1: 18.4 R3: 18.4
37		Efficiency of Class A Amplifier, Efficiency of Class B Amplifier	T1: 18.7 R3: 18.9
38		Class-B Push-Pull Amplifier	R3: 19.0
39	Study of Class B Amplifier	Complementary Class B Push-Pull Amplifier,	R3: 19.1
40	Study of Distortion, Thermal stability and Heat sinks	Distortion in Power Amplifiers, Thermal Stability and Heat Sinks.	R3: 19.2
LINEAR WAVE SHAPING			
41	High pass RC Circuits	Response of High pass circuit to step, pulse, square wave input	T2:6.1,6.3 R1:17.4,17.6 R3: 17.13,17.14 &17.15
42		Response High pass circuit to ramp & exponential wave input, RC High pass as Differentiator	T2:6.10 R1 : 17.17
43	Low Pass RC Circuit	Response Low pass circuit to	T2:6.4,6.5&6.6

		step, pulse, square wave input	R3 **:** 17.18
44		Response Low pass to ramp & exponential wave input, RC Low pass as Integrator	T2:6.11&6.12 R3 **:** 17.19, 17.20 R1: 17.9
UNIT:V SWITCHING CHARACTERSTICS OF DEVICES			
45	Diode as a switch &Linear diode characteristics	Working principle, concept of offset or threshold voltage of diode	R1: 3.1
46	Diode switching times	study of the various switching times of diode	R1: 3.2
47	Transistor as a switch	Working principle, transistor at cutoff & its circuit consideration	R1: 3.4,3.5
48	Breakdown voltage consideration of transistor	Derivation for breakdown voltage with & without open circuited base for CE configuration	R1: 3.6
49	Saturation parameter for transistor	Concept of voltage drive & current drive, Tests for saturation	R1: 3.7
50	Temperature variation of saturation parameters	Temperature dependence of v_{BE}, V_{CE}, h_{FE} variability of parameters	R1: 3.8
51	Design of transistors switch & its switching times	Design of switch using transistor different application	R1: 3.9
MID-2			

TUTORIAL PLAN:

Tutorial No	Unit No	Title	Salient topics to be discussed
T1	I	Single stage Amplifiers Design and Analysis	Design of CE amplifier
T2	I	Single stage Amplifiers Design and Analysis	Design of CB,CC amplifiers
T3	I	Feedback amplifiers	Problems on Different feedback configurations
T4	II	BJT & FET Frequency response	Problems on BJT amplifiers
T5	II	BJT & FET Frequency response	Problems on FET amplifiers
T6	III	Multivibrators	Problems on self biased bistable multivibrator
T7	III	Multivibrators	Problems on monostable multivibrator
T8	III	Multivibrators	Problems on astable multivibrator and Schmitt trigger
T9	III	Clippers and Clampers	Problems on clipping circuit.
T10	III	Clippers and Clampers	Problems on clamping circuit.
T11	IV	Large signal amplifiers	Problems on Different power amplifier circuits
T12	IV	Linear wave Shaping	Problems on when response of a sinusoidal input to a low pass & high RC Circuit
T13	V	Switching characteristics of device	Design of transistor switch.

7.6.11 STUDENTS SEMINAR TOPICS

1. Designing of Single Stage Amplifiers
2. Advantages and Disadvantages of Cascaded Amplifiers
3. Analysis of Tuned Amplifiers

4. Applications of Power Amplifiers
5. Pspice programming
6. Applications of multi vibrators

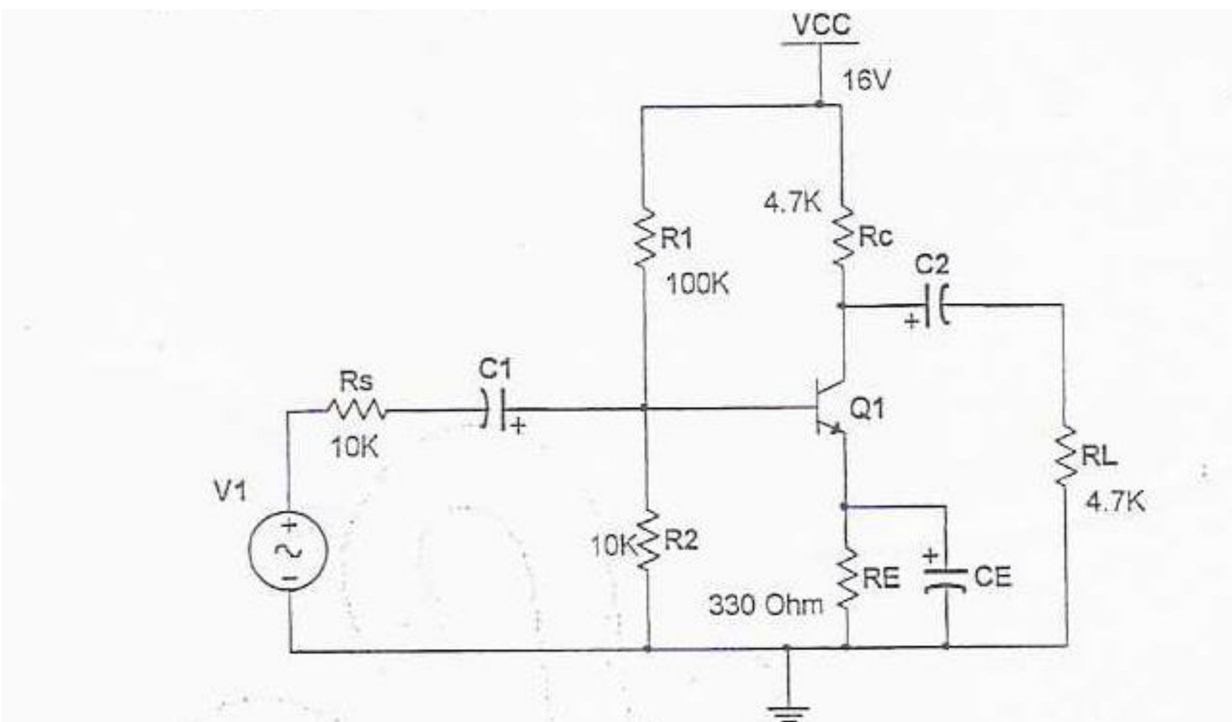
7.6.12 QUESTION BANK

UNIT-I

1. Compare the transistor(BJT) amplifier circuits in the three configurations with the help of h-parameters values. **(DEC2014)**
2. a) What are the causes of the following distortions in BJT amplifiers?
   Non-linear Distortion ii) Phase Distortion iii) Frequency Distortion.

b) For the transistor amplifier shown below, calculate A_V,A_I,A_{VS},R_i and R_0.

Assume all capacitors to be arbitrarily large and the following h-parameter values.
hie=1.1Kohm; hfe=50; hre=$2.5\text{x}10^{-4}$; hoe=24microA/V. **(MAY2013)**



3. (a) Compare BJT amplifier configurations based on Ai, Av, Ri and Ro.
(b) The h-parameters of CE amplifier with Rs= 1 k, RL=10k, hie=1.1 K, hre=2.5 _ 10□4, hfe=50 and hoe=24µA/V. Find out current and voltage gain with and without source resistance, input and output impedances? **(MAY2012)**
4. (a) Explain the effect of coupling capacitor CC on low frequency range.

(b) How does the emitter bypass capacitor CE determines a lower 3 dB frequency?
Derive the required results. **(MAY2012)**

5. (a) Draw the Circuit Diagram of CC Amplifier and explain its working.
(b) Describe the basic BJT Amplifier in CE Configuration. Derive the expressions for current gain, voltage gain, input impedance, output impedance and Power Gain.
(MAY2012)

6. (a) Draw the Circuit Diagram of Emitter Follower and explain its working.
(b) The h-parameters of a transistor connected as CE amplifier are hie=1100, hre=2.54X10^{-4}, hfe=50 and hoe=25microA/V. Find various gains and Input and out Impedances (if Rs= RL=1k). **(MAY2012)**

FEEDBACK AMPLIFIERS

1**.** a) Classify different type of fee back amplifiers.
b) Compare voltage series and voltage shunt amplifiers. **(DEC2014)**

2. a) Describe the four negative feedback configurations in BJT amplifiers with suitable block schematics.
b) If the gain of the amplifier reduces to 1% of its open loop gain of 120 with negative feedback, compute the feedback factor and loop gain.

c) Identify the type of feedback provided in i) CC amplifier ii) CE amplifier with un bypassed R_E. **(MAY2013)**

3. (a) The gain of an amplifier is decreased to 1000 with negative feedback from its gain of 5000. Calculate the feedback factor and amount of negative feedback in dB.
(b) Classify types of feedback amplifiers based on the parameters sampled and feedback. **(MAY2012)**

4. (a) Classify amplifiers based on feedback topology. Explain the topologies based on block diagram and equivalent circuit.
(b) An amplifier has a value of Rin= 4.2 k, Av=220 and A_i=0.01, determine the value of input resistance with feedback? **(MAY2012)**

5. (a) How does negative feedback effect the input and output resistances? Justify your statement with required derivations for any feedback configuration.
(b) For an amplifier of 60dB gain it has an output impedance, z0 = 10 k it is required to modify its output impedance to 500 by applying negative feedback, calculate the value of feedback factor, also find the percentage change in the overall gain for 10% change in the gain of the internal amplifier. **(MAY2012)**

6. (a) Briefly discuss about the effect of feedback on amplifier band width and input impedance. Is the effect same for all feedback configurations? Justify.
(b) The gain of an amplifier is decreased to 10,000 with negative feedback from its
gain of 60,000. Calculate the feedback factor, express the amount of negative feedback in dB.
(MAY2012)

UNIT-II

1. a) Draw the high frequency equivalent circuit of a BJT and explain the same.
   b) Explain about miller effect capacitance. **(DEC2014)**

2. a) What are the circuit components which determine the low frequency cut-off of a small signal BJT amplifier in Common Emitter configuration? Discuss.
   b) If two JFET CS amplifiers each with a lower cut-off frequency of 500Hz are cascaded, what is the resultant lower cut-off frequency?
c) State and explain Miller's theorem. Apply the theorem for determining the equivalent capacitances at input and output of a BJT CE amplifier. **(MAY2013)**

3. a) Write short notes on the importance of square wave testing.
   b) Derive an expression for decibel gain of cascaded systems. **(MAY2012)**

4. (a) Using the approximate model derive expressions for current gain, voltage gain, input impedance and output impedance of CC Amplifier. **(MAY2012)**

(b) Explain the operation of Common Source FET Amplifier.
5. (a) Show that the decibel gain of cascaded system is Gv = Gv1 +Gv2 +Gv3 +- - - - +Gvn whereGv1;Gv2;- - - -+Gvn are gains of individual stages.
(b) Show that for low frequency response of CE amplifier the gain in dB is given by, Av(dB) = -20 log10(f/f1) where f1 is the lower cut of frequency. **(MAY2012)**

6. (a) With the help of neat sketches explain the Gain - versus - frequency for RC coupled amplifier, transformer coupled amplifier and direct coupled amplifier by showing the effects of parasitic capacitance of active devices and circuit Capacitors..
(b) The input power to a device is 10,000 watt at a voltage of 1000V the output
Impedance is 20.
i. Find power gain in decibels.
ii. Find voltage gain in decibels. **(MAY2012)**

UNIT-III

MULTIVIBRATORS

1. With the help of a neat circuit diagram and waveforms explain the working of an Astable multivibrator. **(DEC2014)**

2. With relevant transistor based circuit diagrams explain the operation of following:
   a) Astable multivibrator
   b) Schmitt Trigger.

(MAY2013)

3 .a) With necessary transfer characteristics, explain how an emitter coupled transistor clipper functions. Can it be used as a comparator? Use suitable circuit diagrams to explain.
b) Design a diode based clamper for the following specifications
   i) Input is a symmetrical square wave of -5V to +5V swing and output has DC such that the –ve peak shifts to 0V.
   ii) Input is a symmetrical square wave of -5V to +5V swing and output has DC such that the output swing is from -8v to +2v. **(MAY2013)**

4. (a) Explain various methods to improve the resolution of a binary.
(b) A collector - coupled ONE-SHOT is designed using silicon npn transistors with hFE(min)=20. Assume VBE = -1V for the transistor in cut-off and IB = 1.5IB(min) for the transistor in saturation, VCC= 8V, IC(sat) =2mA, T = 2ms & R1 = R2. Find RC, R, R1, C and VBB. **(MAY2012)**

5. (a) What do you mean by collector catching diodes? Explain the need of these diodes in a bistable multivibrator.
(b) Silicon transistors with hFE(min) = 40, VBE(sat) = 0.7V, VCE(sat) = 0.3V, IC(sat)= 10 mA are available. Design an astable multivibrator to generate a square wave of 1 KHz frequency with a duty cycle of 25% . **(MAY2012)**

6. A self-biased binary uses n-p-n transistors having worst-case (max.) values of VCE(sat) = 0.4V and VBE(sat) = 0.8V and VBE cutoff = 0V. Given: Vcc = 15V, Rc= 390 , find the stable-state currents and voltages. Also find the minimum value of h_{FE} required of BJT to provide the above stable state values. Also determine ICBO(max) to which ICBO raises as temperature rises where neither BJTs is off.
(MAY2012)

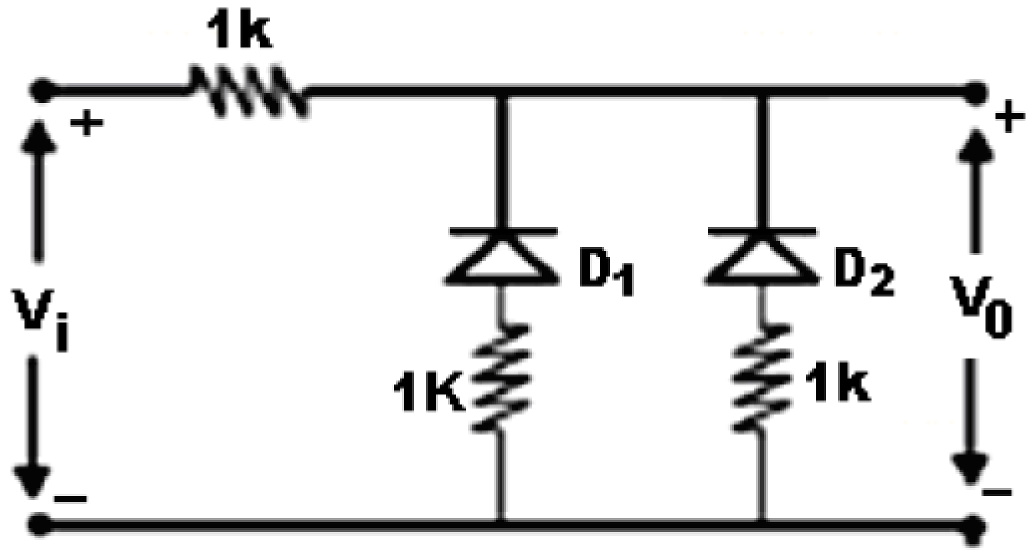
7. (a) Discuss the different methods of triggering a i/p-o/p.
(b) Explain the operation of emitter coupled bistable multivibrator. **(MAY2012)**

CLIPPERS AND CLAMPERS

1. a) Write the procedure for designing a clipping circuits.
b) Draw a circuit, to transmit that part of a sine wave which lies between -3V and +6V.
(DEC2014)

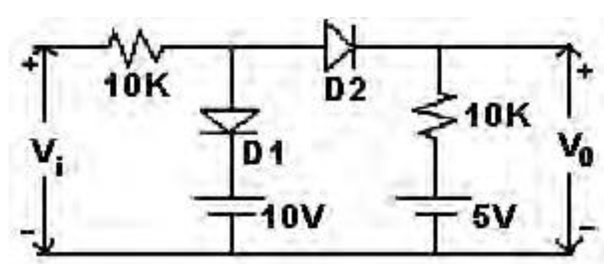
2. (a) Give the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics.
(b) Draw the diode differentiator comparator circuit and explain the operation of it when ramp input signal is applied. **(MAY2012)**

3. (a) For the clipper circuit shown in Figure , write the transfer characteristic equations & draw the transfer characteristic plot, indicating all intercepts slopes & voltage levels.(Assume diodes as ideal).
(b) Explain about effect of diode characteristics on clamping voltage.



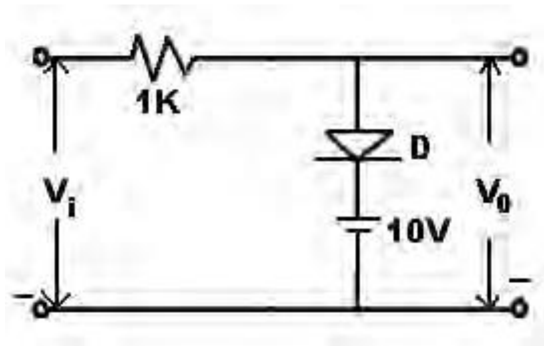
(MAY2012)

4. (a) Draw and explain circuit of two diode clipper, also draw necessary waveforms.
(b) For the circuit shown in Figure , an input voltage Vi, varies linearly from 0 to 50V is applied. Sketch the output waveform VO to the same time scale. Assume ideal diodes.



(MAY2012)

5.(a) Give the circuits of series & shunt clippers and explain their operation with the help of transfer characteristics.
(b) For the circuit shown in the Figure, sketch the input and output waveforms if R = 1 K, VR = 10 V, Vi = 20 Sin ŵt, Rf = 100 Rr = 1, V = 0.



(MAY2012)

UNIT-IV

1. a) Classify amplifiers based on the location of the operating point on the output curves for large signal input.
   b) Show that the maximum conversion efficiency of a class B amplifier in push-pull configuration is about 78.5%.
   c) What is cross over distortion? How can it be eliminated effectively? **(MAY2013)**

2. (a) Determine the power dissipation capability of a transistor, which has been mounted with a heat-sink having thermal resistance of _HS□A(Heat Sink-to-Ambience) = 80C/W, _J□C (Junction-to-Case) = 50C/W, _C□A (Case-to-Ambience) = 850C/W at a junction temperature of 1600C and ambient temperature of 400C.
(b) When are two transistors said to be configured in Complementary Symmetry? Draw the circuit of a complementary symmetry Push-Pull Class-B Power Amplifier and explain its operation together with characteristics of amplifier. **(MAY2012)**

3. Derive the expression, with necessary diagrams, to calculate the total harmonic distortion `D' in power amplifiers using the _ve-point method of analysis. **(MAY2012)**

4. Calculate the power dissipated in the individual transistors of a class B push-pull power amplifier, if VCC = 20V and RL = 4. Assume the circuit parameters necessary. **(MAY2012)**

5. (a) Explain about heat sinks. Explain the term Thermal Resistance. Give the sketches of heat-sinks.
(b) What is the Junction to ambient Thermal Resistance for a device dissipating 600mw into an ambient temperature of 50^{0C} and operating at a junction temperature of 110^{0C}? **(MAY2012)**

LINEAR WAVESHAPING:

1. a) With the help of circuit diagram, explain the working of RC and RL low-pass circuit.
   b) Why are RC circuit commonly used compared to RL circuit? **(DEC2014)**

2. Obtain expressions for the output voltage of an RC low pass filter for sinusoidal, step, ramp and square wave inputs. Under what conditions, a triangular wave can be obtained with a square wave input to an RC network? Explain. **(MAY2013)**

UNIT-V

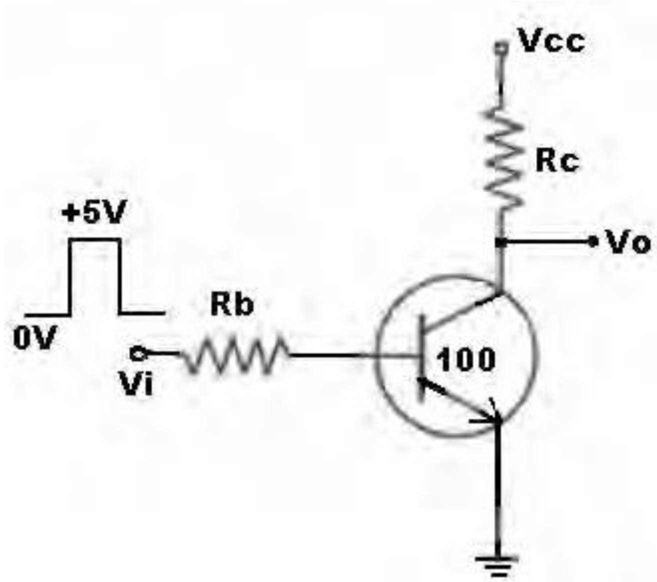
1. A rectangular pulse of voltage is applied to the base of a transistor driving it from cut-off to saturation discuss the changes in output potential explain the various times involved in the switching process. **(DEC2014)**

2. (a) Explain in detail the junction diode switching times.
   (b) Give a brief note on piece-wise linear diode characteristics. **(MAY2012)**

3. Design a common-emitter transistor switch shown in Figure 2, operated with Vcc= 18V and -Vbb = -12V. The transistor is expected to operate at IC = 8mA, IB =0.75mA. Assume hFE = 25, VBE(sat) = VCE(sat) = 0V and R2 = 6 R1. **(MAY2012)**

4. (a) A rectangular pulse of voltage is applied to the base of a transistor driving it from cut-off to saturation. Discuss the changes in the output potential. Also explain various times involved in the switching process.
(b) Calculate the maximum operating frequency of a diode with storage time of 1ns and transition time of 8ns. **(MAY2012)**

5. The circuit shown in Figure uses a silicon transistor with hFE = 100 and VBE =0.7V. Find the value of R which saturates the transistor, when input voltage is +5V. Given RC = 1K & VCC = +5V.



(MAY2012)

Assignment Questions

UNIT 1

1. Draw the circuit diagram and Small Signal Model of Common Emitter Amplifier. Derive expressions for its current gain, input resistance, output resistance and Voltage gain.

2. Draw the circuit diagram of Emitter follower and derive the equation for voltage gain, input resistance, output resistance and current gains.

3. State Miller's theorem. Specify its relevance in the analysis of a BJT amplifier

4. i. Reason out the causes and results of Amplitude, Phase & Frequency distortions in transistor amplifiers.

   ii. Write short notes on Classification of Amplifiers.

5. Draw the circuit diagram and Small Signal Model of Common Base Amplifier. Derive expressions for its current gain, input resistance, output resistance and Voltage gain.

FEEDBACK AMPLIFIERS

1. i. Draw the Generalized block diagram of negative feedback amplifier and calculate transfer gain.
   ii. Write the advantages of negative Feedback amplifiers.
2. Mention about different types of basic amplifiers used in feedback amplifiers.
3. What are the different feedback topologies? Derive gain, input and output resistance in all topologies.
4. Explain with equations stability of amplifiers with and without feedback.
5. i. Compare different feedback amplifiers.
   ii. Write the procedural steps to carry out the analysis in different topologies.

UNIT II

1. Draw the hybrid – π Model of BJT. Describe each component in the model in detail. Also derive the expressions for input conductance, feedback conductance, output conductance and base spreading resistance in the hybrid –π model.

2. With the help of neat diagrams and necessary equations, explain the effect of bypass, coupling capacitor on the performance of an amplifier at low frequencies. Also derive the expression for lower 3-db frequency established by the coupling capacitor.

3. Derive the expression for the CE short circuit current gain as a function of frequency.
4. i. Define f_β and f_T and also establish the relationship between f_β and. f_T
   ii. write short notes on Gain bandwidth product.
5. Describe how an emitter follower behaves at high frequencies.

UNIT III
MULTIVIBRATORS

1. Explain the operation of emitter coupled bistable multivibrator.
2. Draw the circuit diagram of a Schmitt trigger circuit and explain its operation. Derive the Expressions for its UTP and LTP.
3. Draw and explain the circuit of Astable Multivibrator with necessary waveforms and also derive the expression for its frequency of oscillations.
4. What is a monostable multivibrator? Explain with help of a neat circuit diagram the principle of operation of a monostable multivibrator, and derive an expression for pulse width. Draw the wave forms at collector and base of both transistors.
5. Explain asymmetrical triggering in a binary and mention its uses

CLIPPERS AND CLAMPERS

1. State and prove clamping circuit theorem

2. Explain the response of the clamping circuit when a square wave input is applied under steady state conditions

3. Draw the basic circuit diagram of negative peak clamper circuit and explain its operation
4. What is meant by comparator and explain diode differentiator comparator operation with the help of ramp input signal is applied.
5. Determine Vo for the network shown in figure 1 for the given waveform. Assume ideal Diodes.

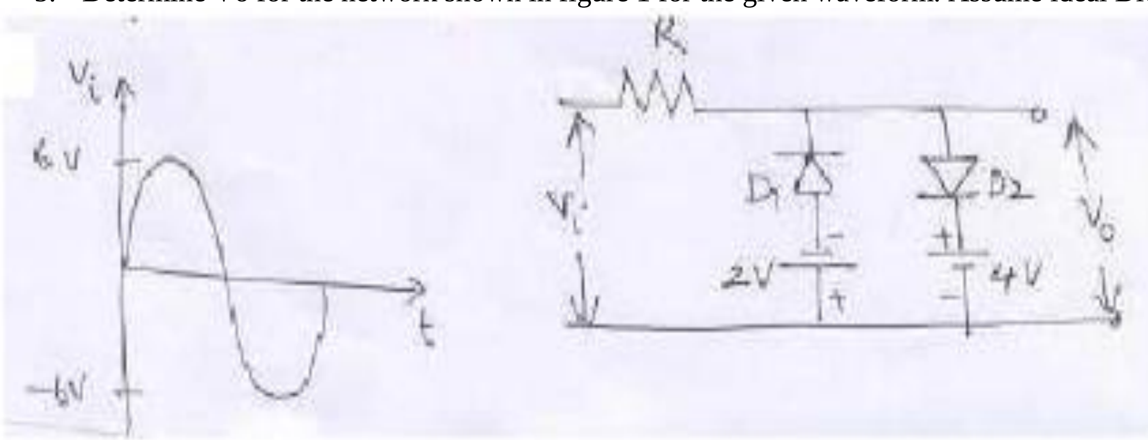


Figure 1:

UNIT IV

1. Derive the expression, with necessary diagrams, to calculate the total harmonic distortion 'D' in power amplifiers using the three-point method of analysis.
2. Define conversion efficiency. Determine the maximum value of conversion efficiency for a series - fed and transformer coupled class A power amplifier.
3. i. With the help of a suitable circuit diagram, show that the maximum conversion efficiency of a class B power amplifier is 78.5%.
   ii. Explain how Total harmonic distortion can be reduced in a Class B push-pull configured amplifier.
4. i. A single stage class A amplifier Vcc=20V, V_{CEQ} =10V, I_{CQ} =600mA, RL=16. The ac output current varies by ±300mA, with the ac input signal. Find
   a. The power supplied by the dc source to the amplifier circuit.
   b. AC power consumed by the load resistor.
   c. AC power developed across the load resistor.
   d. DC power wasted in transistor collector.
   e. Overall efficiency

f. Collector efficiency.

ii. List the advantages of complementary-symmetry configuration over push pull configuration.

5.Write short notes on Classification of power amplifiers.

UNIT V

1. Explain Piecewise linear characteristics of diode

2. Explain Zener & Avalanche breakdown mechanisms in diodes.

3. Define rise time and fall time of a transistor switch. Derive expressions for these in terms of the transistor parameters and operating currents.

4. List the disadvantages of using transistor as a switch

5. Compare machanical switch with a diode switch and transistor switch