

Department of Technical Education
DIPLOMA COURSE IN ELECTRONICS AND COMMUNICATION ENGINEERING

Third semester
Subject : Analog Electronic Circuits

Contact Hrs/Week: 4

Contact Hrs: 64

GENERAL EDUCATIONAL OBJECTIVES :

- 1 Understand the working of DC regulated power supplies.
- 2 Know the basics of UPS and SMPS.
- 3 Study of various types of IC Regulators , Amplifiers.
- 4 Understand the OPAMP and its Applications.
- 5 Generation of Waveforms.
- 6 Applications of IC 555 Timer and understand the working of PLL.
- 7 Understand Diode as Clipper and Clamper , RC Wave shaping Circuits

CONTENTS

	UNIT-1	
Power supplies		10 hr
Waveform generators		08 hr
	UNIT 2	
Amplifiers		14 hr
Wave shaping Circuits		04 hr
	UNIT 3	
Operational amplifiers		14 Hrs
Instrumentation amplifier, PLL		05 Hrs
Tests		04 Hrs
Industry Innovations (Students should collect and present the Latest Developments in the Field)		05 Hrs
	Total	64 Hrs

DETAILS OF CONTENTS

1. POWER SUPPLIES

Block diagram of Regulated power supply, Bridge Rectifier, Filter, Voltage Regulator, IC Voltage Regulator -fixed and variable, Basic Switching IC Regulator, SMPS, UPS.

2. AMPLIFIERS

Operating point and biasing of bipolar transistor and FET, Loadline, Classification Of Amplifiers, Small signal and Large Signal Amplifiers, common emitter RC coupled amplifier, Power Amplifiers, Efficiency of Power Amplifiers, and Voltage Gain of Multistage Amplifiers

3. OPERATIONAL AMPLIFIERS

Basic Differential amplifier, Block diagram of OPAMP, Ideal characteristics, parameters, open loop configuration of opamp, Application circuits of OPAMP, Active filters.

4. WAVEFORM GENERATORS

Feedback concept, Types of feedback, LC Tank circuit, Barkhausen criterion, types of RC and LC Oscillators, Block diagram of 555 IC, Multivibrators using IC 555.

5. INSTRUMENTATION AMPLIFIER and PLL.

Instrumentation amplifier, Voltage to frequency Converter, PLL working and Applications

6. WAVESHAPING NETWORKS

RC Differentiator and Integrator circuits, Clippers and Clampers.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1 POWER SUPPLIES

- 1.1 Appreciate the need for dc regulated power supplies
- 1.2 Describe the block diagram of regulated power supply

- 1.3 Define Ripple Factor, Ripple Frequency, Efficiency, Peak Inverse Voltage with expressions of rectifiers
- 1.4 Describe the operation of bridge rectifier
- 1.5 Compute ripple factor and efficiency of bridge rectifier and solve simple problems
- 1.6 Explain the need of filters in power supplies and working of C and PI filter along with waveforms.
- 1.7 Understand the purpose of voltage regulator in power supplies
- 1.8 Explain the working of voltage regulator using zener diode and explain line and load regulation.
- 1.9 Explain Transistor and opamp series voltage regulator With Short-circuit or Overload Protection (current limiting)
- 1.10 Draw functional block diagram of IC voltage regulator 723 and describe circuit of 723 as voltage regulator.
- 1.11 Study of IC voltage regulators i) 7812 ii) 7912 iii) LM 317
- 1.12 Explain Basic Switching Regulator - Step down and Step up Configuration.
- 1.13 Explain the block diagram of SMPS and Mention its advantages.
- 1.14 Explain the block diagram of UPS and explain ON-Line and OFF-Line UPS.

Refer : Anil K. Maini & Varsha grawal

2 AMPLIFIERS

- 2.1 Need for Biasing and define operating point
- 2.2 Explain DC load line and Stability Factor
- 2.2 Analysis of voltage divider bias for BJT.
- 2.3 Analysis of Self Bias for FET .
- 2.4 Mention the Classification of amplifiers – Based on Coupling, Frequency, usage, mode.
- 2.5 Definition of Small signal and Large Signal Amplifiers.
- 2.6 Concept of Negative Feedback and its advantages.
- 2.7 Small Signal Amplifier : Explain the working of common emitter RC coupled amplifier and its frequency response.
- 2.8 Large Signal Amplifier :
 - I. Difference between voltage and power amplifier
 - II. Concept of AC load line
 - III. Explain the working of
 - IV. Class A - Series fed amplifier
 - Transformer coupled amplifier
 - V. Class B - Push pull amplifier
 - Complementary symmetry push pull amplifier
 - VI. Class AB and Class C amplifier
 - VII. Expression for output power and Maximum Power Efficiency of
 - VIII. Power Amplifiers(All Types).
- 2.9 Comparison of different types of power amplifiers.

2.10 Multistage Amplifiers – voltage Gain.

Refer : Electronic Circuits -R.S.Sedha

3 OPAMPS

- 3.0 Explain Basic differential amplifier.
- 3.1 Draw and explain block diagram of OPAMP.
- 3.2 List ideal characteristics of opamp and Concept of Virtual Ground.
- 3.3 Define opamp parameters : input offset voltage, input offset current, Supply voltage Rejection Ratio, CMRR ,input and output impedance, gain, gain-bandwidth product, slew rate.
- 3.4 Know about open loop configuration of opamp.
- 3.5 Explain the following circuits of opamp
 - i) Inverting and Non Inverting amplifier- Derivation of Gain xpression.
 - ii) Summing amplifier, Difference amplifier.
 - iii) Differentiator, Integrator, Voltage Follower, Comparator, Precision Full Wave rectifier, Zero Crossing Detector, Schmitt Trigger.
- 3.6 Active filter - I st order Butterworth
Low pass filter, High pass filter, Band pass filter,
Band Rejection filters (Notch Filter).

**Refer : Opamps and Linear integrated circuits
- Ramakanth A.Gayakwad**

4 WAVE FORM GENERATORS

- 4.1 Concept of Positive Feed back
- 4.2 Explain Barkhausen criteria.
- 4.3 Explain LC Tank Circuit
- 4.4 Explain working of Heartley, Collpits and Crystal Oscillator using BJT.
- 4.5 Explain the working of RC phase shift, wein bridge oscillators using BJT.
- 4.6 Explain Functional Block diagram and pin diagram of 555 IC.
- 4.7 Explain the operations of Actable and Monostable Multivibrators
Using IC 555.

**Refer : Opamps and Linear integrated circuits
-Ramakanth A.Gayakwad.
Electronic Circuits -R.S.Sedha**

5 INSTRUMENTATION AMPLIFIER and PLL

- 5.0 Explain the need for Instrumentation Amplifier.
- 5.1 Describe the Instrumentation Amplifier circuit.
- 5.2 Explain the circuit of voltage to frequency converter.
- 5.3 Explain the operation of PLL.
- 5.4 Explain the circuit of frequency multiplier using PLL.
- 5.5 Mention the Applications of PLL.

**Refer : Opamps and Linear integrated circuits
-Ramakanth A.Gayakwad**

6 WAVE SHAPING CIRCUITS

6.0 Explain the working of RC Differentiator and Integrator.

6.1 Explain the working of following clipper and clamper circuits

i) +ve and –ve clipper (series and shunt)

ii) Combinational clipper.

iii) +ve and –ve clamper

6.2 Mention the Applications of clippers and clampers.

Refer – Electronic Circuits - By R S SEDHA

TEXT BOOKS:

1. Electronic Devices and Circuits: - Anil K. Maini
Varsha Agrawal
(Wiley India Pvt Ltd)
2. Electronic Circuits - By R S SEDHA (2010 Edition)
3. Opamps and Linear integrated circuits - Ramakanth A.Gayakwad

References:

1. Electronic Devices: -Thomas L. FLOYD - Seventh Edition
(Pearson Publishers).
1. Opamps and Linear IC's - David a Bell
2. Electronic devices and circuit theory
- Robert I Boylestead and Lewis Nashelesky.
3. Electronic Devices and Circuits – B.L . Theraja.
4. Principles of Electronics - V.K. Mehtha.
5. Analog Electronic Circuits - By K Shashidhar, Sapna Publications

**DEPARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN ELECTRONICS & COMMUNICATION ENGG.
THIRD SEMESTER**

**MODEL QUESTION PAPER
ANALOG ELECTRONIC CIRCUITS**

MAX MARKS:100

TIME :3Hrs

INSTRUCTIONS:-

- 1 **SECTION-I IS COMPULSORY**
- 2 **ANSWER ANY TWO FULL QUESTIONS FROM EACH OF THE REMAINING SECTIONS.**

SECTION I

- 1 A) **FILL IN THE BLANKS WITH APPROPRIATE WORDS:-** **1X5**
- i) The Ripple Factor of Bridge rectifier is _____.
 - ii) The Cross over Distortion is overcome in _____ amplifier.
 - iii) The input impedance of an Ideal OPAMP is _____.
 - iv) PLL stands for _____.
 - v) Oscillator uses _____ Feedback.
- B) Write a note on IC Switching Regulators. **5**

SECTION :II

- 2 a) Define the following terms **4**
- I) Ripple Factor.
 - II) Regulation.
- b) Explain block diagram regulated Power Supply. **6**
- c) Explain operation of Bridge Rectifier with a neat circuit diagram. **5**
- 3 a) Explain the circuit of Series Voltage Regulator. **6**
- b) Explain the need for filters in rectifiers. **5**
- c) Mention the advantages of SMPS. **4**
- 4a) Explain functional block diagram of IC 555 Timer. **10**
- b) Explain the operation of Colpitts Oscillator. **5**

SECTION : III

- 5a) Define Biasing . Explain Voltage divider Bias with a neat Circuit diagram **6**
- b) Give the detailed classification of Amplifiers. **4**
- c) Explain the frequency response of RC coupled amplifiers. **5**
- 6a) Explain the working of complementary push pull power amplifier with a neat circuit. **7**
- b) A cascaded voltage amplifier having Gains $A_{v1}=10$, $A_{v2}=15$, $A_{v3}=20$ Determine overall Voltage gain and Gain in Decibels. **4**
- c) Explain double ended Clipper with a neat circuit diagram. **4**
- 7a) Explain the operation of RC Differentiator and Integrator Circuit with waveforms. **10**
- b) List the application of Clippers and Clampers. **5**

SECTION :IV

- 8a) Draw and explain block diagram of LM741 opamp. **5**
- b) List the ideal characteristics of opamp. **5**
- c) Explain the operation of Schmitt Trigger circuit using OPAMP. **5**
- 9a) Define the following parameters w.r.t OPAMP **10**
- i) PSRR
 - ii) CMRR
 - iii) Gain-Bandwidth product
 - iv) Slew rate
 - v) Input and Output Impedance.
- b) Describe the Instrumentation Amplifier circuit. **5**
- 10a) Explain the 1st order Butterworth Active Low Pass using OPAMP. **5**
- b) Explain the circuit of Voltage to frequency Converter . **5**
- c) Explain the operation of PLL . **5**