



**PARVATHANENI BRAHMAYYA  
SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

*Autonomous*

Siddhartha Nagar, Vijayawada-520010

*Re-accredited at 'A+' by the NAAC*

**23ELMAL122:** Circuit Theory and Electronic Devices

**Offered to:** B.Sc. Honours (Electronics)

**Course Type:** Major 4 (Core -TH)

**Year of Introduction:** 2023-24

**Year of offering:** 2023 - 2024

**Semester:** II

60 Hrs

**Credits:** 3

Couse Outcomes: At the end of this course, students should be able to:

| Course Outcome NO | Outcome  | Mapping to |
|-------------------|--|------------|
| CO1               | Analyze Passive Networks                             | PO6        |
| CO2               | Analyze Networks Theorems                            | PO7        |
| CO3               | Determine the VI Characteristics of different Diodes | PO3        |
| CO4               | Understand functionality of BJT, FET & UJT Devices   | PO1        |
| CO5               | To understand the concept of power supply            | PO2        |

| CO-PO MATRIX      |            |     |     |     |     |     |     |     |
|-------------------|------------|-----|-----|-----|-----|-----|-----|-----|
|                   | CO-PO      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| <b>23ELMAL122</b> | <b>CO1</b> |     |     |     |     |     | 2   |     |
|                   | <b>CO2</b> |     |     |     |     |     |     | 3   |
|                   | <b>CO3</b> |     |     | 2   |     |     |     |     |
|                   | <b>CO4</b> | 2   |     |     |     |     |     |     |
|                   | <b>CO5</b> |     | 3   |     |     |     |     |     |

**UNIT- I (10 Hours)**

**Passive Networks: (D.C)**

Resistor, Capacitor, and Inductor, Ohm's Law, Kirchoff's Law's, series, parallel and series-parallel networks, Branch current method, Mesh Analysis, star to delta & delta to star conversions. (Problems)

**UNIT- II (10 Hours)**

**Networks Theorems: (D.C)**

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power, and Milliman's theorem (problems).

**UNIT- III (10 Hours)**

**Diodes:**

Construction, working, V-I characteristics of P-N junction Diode, Diode current equation- Effect of temperature on reverse saturation current, construction, working, and V-I characteristics of varactor diode, Zener diode, Schottky diode and Tunnel diode.

#### **UNIT- IV (10 Hours)**

##### **BJT, FET & UJT:**

**BJT:** Construction, Working, and Characteristics of CE Configurations, Hybrid Parameters and Hybrid Equivalent Circuit of CE Transistor.

**FET:** Construction, Working and Characteristics of JFET and MOSFET, Advantages of FET over BJT.

**UJT:** Construction, Working and Characteristics of UJT, UJT as a Relaxation Oscillator.

#### **UNIT-V (10 Hours)**

##### **Power Supplies & Photo Electric Devices:**

**Rectifiers:** Half Wave, Full Wave Rectifiers-Efficiency-Ripple Factor.

**Filters:** L - Section &  $\pi$ -Section Filters,

**I.C. Regulators:** 78XX and 79XX.

Light Emitting Diode, Photo diode and LDR.

##### **Text Books:**

1. Robert L. Boylestad, Introductory Circuit Analysis, UBS Publications), Edition, Publication Year.

2. Electronic Devices and Circuit Theory --- Robert L. Boylestad & Louisashelsky.

##### **REFERENCE BOOKS:**

1. Engineering Circuit Analysis By: Hayt & Kemmerly - MG.
2. Networks and Systems – D.Roy Chowdary
3. Unified Electronics (Circuit Analysis and Electronic Devices) by Agarwal-Arora
4. Electric Circuit Analysis- S.R. Paranjothi- New Age International.
5. Integrated Electronics – Millmam & Halkias.
6. Electronic Devices & Circuits – Bogart.
7. Sedha R.S., A Text Book Of Applied Electronics, S.Chand & Company Ltd

##### **Outcomes:-**

1. Apply concepts of electric network topology, nodes, branches, loops to solve circuit problems including the use of computer simulation.
2. Apply time and frequency concepts of analysis.
3. Synthesize the network using passive elements.
4. Know about amplifier circuits, switching circuits and oscillator circuits their design and use in electronics.
5. Design and construction of a power supply



**Model Question Paper**

23ELMAL122: Circuit Theory and Electronic Devices  
Time: 3 Hours

Maximum Marks: 70M  
Pass Minimum: 28M

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**SECTION – A**

Answer the following:

5 x 4 = 20 M

1. (a) Explain Kirchoff's Laws. (Co1- L1)  
(Or)  
(b) Deduce the relation for Star to delta. (Co1- L1)
2. (a) State and explain maximum transfer theorem. (Co2)-(L1)  
(Or)  
(b) State and explain Milliman's theorem.(co2-L1)
3. (a) Explain VI Characteristics of Tunnel Diode. (co3- L2)  
(Or)  
(b) Explain VI Characteristics of Varactor Diode. (Co3-L2)
4. (a) Write about how Transistor acts as a switch. (Co4- L2)  
(Or)  
(b) Discuss the difference between JFET and MOSFET. (Co4- L2)
5. (a) Discuss briefly about photodiode. (co5- L1)  
(Or)  
(b) Explain working of  $\Pi$  section filter. (Co5-L1)

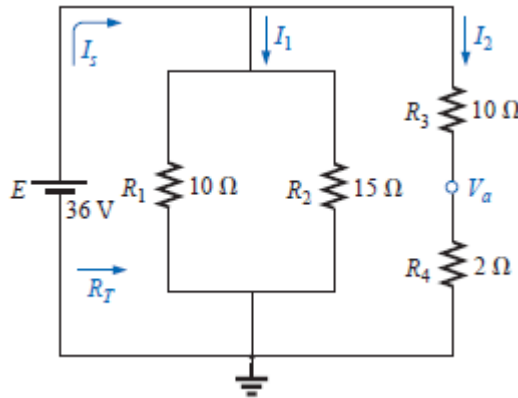
**SECTION – B**

Answer the following:

5 x 10 = 50 M

6. (a) For a network  
 a. Determine  $R_T$ .  
 b. Find  $I_s$ ,  $I_1$ , and  $I_2$ .  
 c. Calculate  $V_a$ .

**(10M)** (CO1-L3)



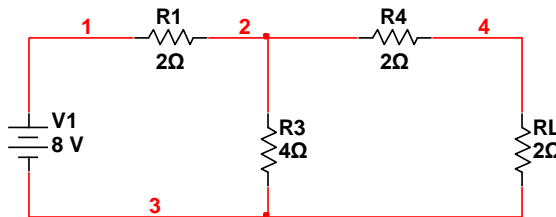
(OR)

- (b) Explain the format approach of mesh analysis. (co1- L3) (10) M

7. (a) State and prove Norton's Theorem. (co2 –L2) 10M

(OR)

- (b) Find the  $I_L$  in the given circuit by using Thevenin's theorem (co2 -L2) 10M



8. (a) Explain operation of PN junction in both forward and reverse bias condition and draw its characteristics. (co3- L2) 10M

(OR)

- (b) Explain operation of Zener Diode and draw its characteristics. (co3- L2) 10M

9. (a) Explain briefly about input and output characteristics of CE configuration.(Co4 - L2)

(OR)

- (b) Explain about the construction and working of FET and explain drain and transfer characteristics of FET .(Co4- L3)

10. (a) Define rectifier and explain briefly about half wave rectifier and derive it's efficiency.(Co5 –L2)

(OR)

- (b) Explain about 3-terminal voltage IC regulators of positive and negative.(Co5 – L2)

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