



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)



Basic Electrical Technology

LECTURE 1 – 20 OCTOBER 2021

- INTRODUCTION TO THE COURSE
- CIRCUIT ELEMENTS

Course Outline



Basic Electrical Technology

DC Circuit Analysis

- Circuit elements
 - Sources
 - Resistor
 - Inductor
 - Capacitor
- Mesh current analysis
- Node voltage analysis
- Superposition Theorem
- Thevenin's Theorem
- Max. Power Transfer Theorem

Magnetic Circuits Analysis

- Magnetism
- Laws of magnetism
- Series and parallel magnetic circuits
- Electromagnetic induction
- Magnetic coupling
- Induced EMF
- Mesh analysis

Single Phase AC Circuit Analysis

- Generation
- Representation
- AC through R, L and C
- Series and parallel circuits
- Power & power factor
- Resonance

Three Phase AC Circuit Analysis

- Generation
- Representation
- Types of load connection
 - Star
 - Delta
- Analysis of balanced and unbalanced loads
- Measurement of Power

Power System Components

- Generation – Transmission - Distribution
- Utilization of Electric power
- Electrical machines
 - Overview
 - Types
 - Working principle
 - Application
- Energy meters

$$[L T P C] = [2 1 0 3]$$

Course Outcome



CO1

Analyze DC Circuit

CO2

Analyze Magnetic Circuit

CO3

Analyze Single Phase AC Circuit

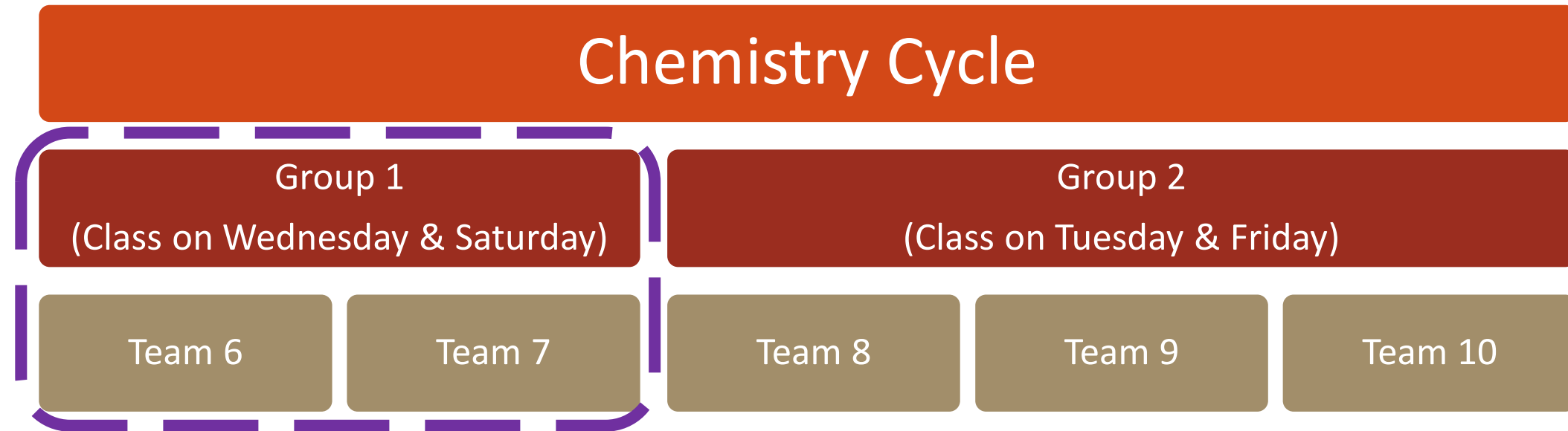
CO4

Analyze Three Phase AC Circuit

CO5

Describe Electrical Power System Components

BET Online Class Structure



Group 1 Faculty Team:



Dr. Prateek Jain

prateek.jain@manipal.edu



Dr. Saikrishna Goud

goud.saikrishna@manipal.edu



Mr. Vipin Valsan

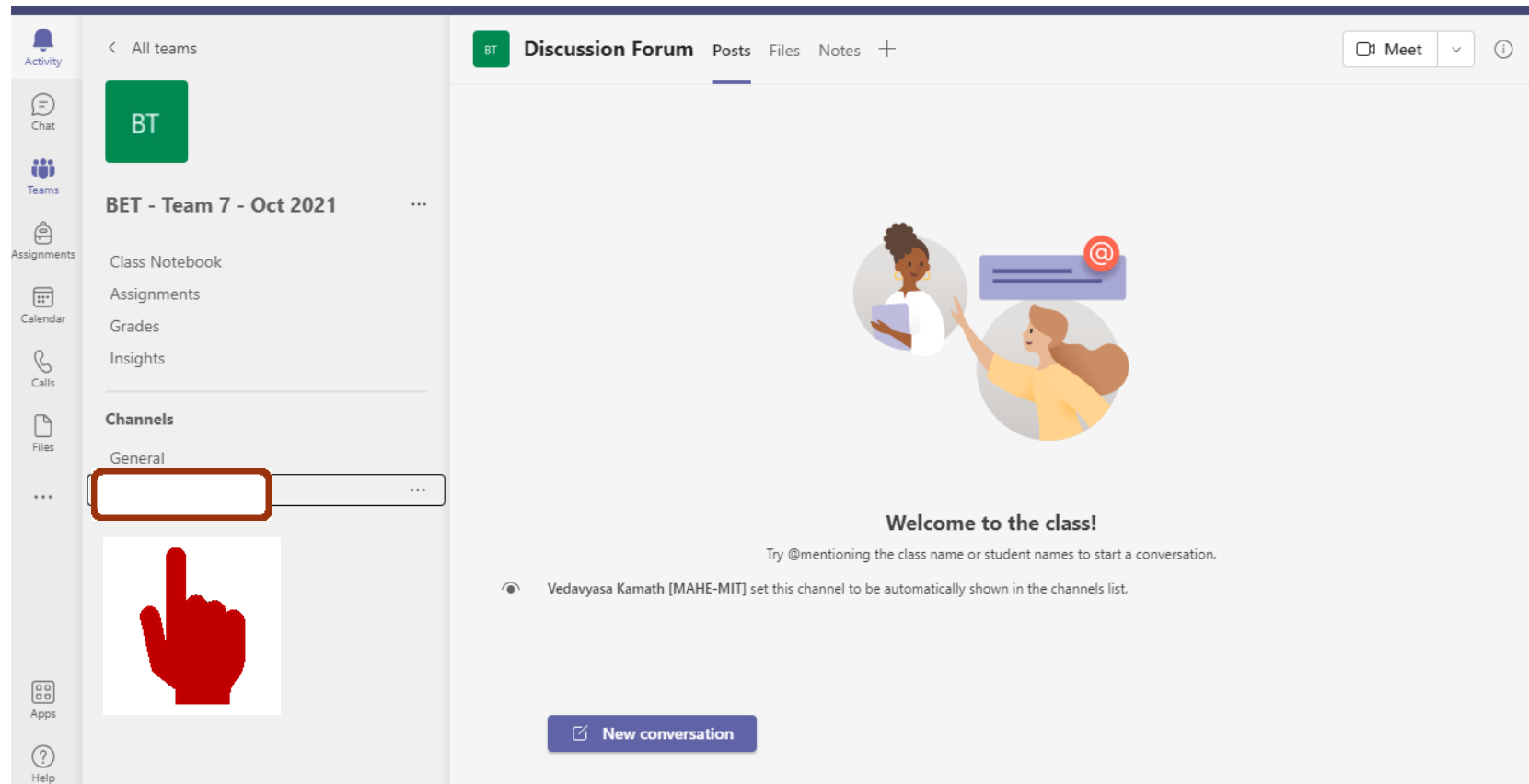
vipin.valsan@manipal.edu



Mr. Vikas Kumar Jhunjunwala

vikas.kumar@manipal.edu

Student Query Resolution



- Know the background of the question
- If possible, mention your approach

Assessment



Quiz	Continuous Assessment	In-Semester	End-Semester
<ul style="list-style-type: none">• 10 %• 5th calendar week• 30 minutes	<ul style="list-style-type: none">• 20 %• 2 marks each quiz• Immediately after every class, 5th calendar week onwards• 10 to 15 minutes	<ul style="list-style-type: none">• 20 %• 90 minutes• 4 questions – 10 marks each	<ul style="list-style-type: none">• 50 %• 180 minutes• 5 questions – 10 marks each

Note:

The course plan will be shared in due course.

Scientific Calculator



- Should be **non – programmable**
- Should be **non - graphical**
- Suggestions:
 - Casio fx-991ES plus (2nd edition)
 - Casio fx-991MS (2nd edition)
 - Casio fx-991ES plus
 - Casio fx-991MS
- Android/Apple OS based apps available
- Windows app (trial for 3 months) available from Casio



Casio fx-991ES plus (2nd edition)



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)



Quiz Time (Ungraded)

Quiz 1 of 5



The domestic electrical installations are connected in _____

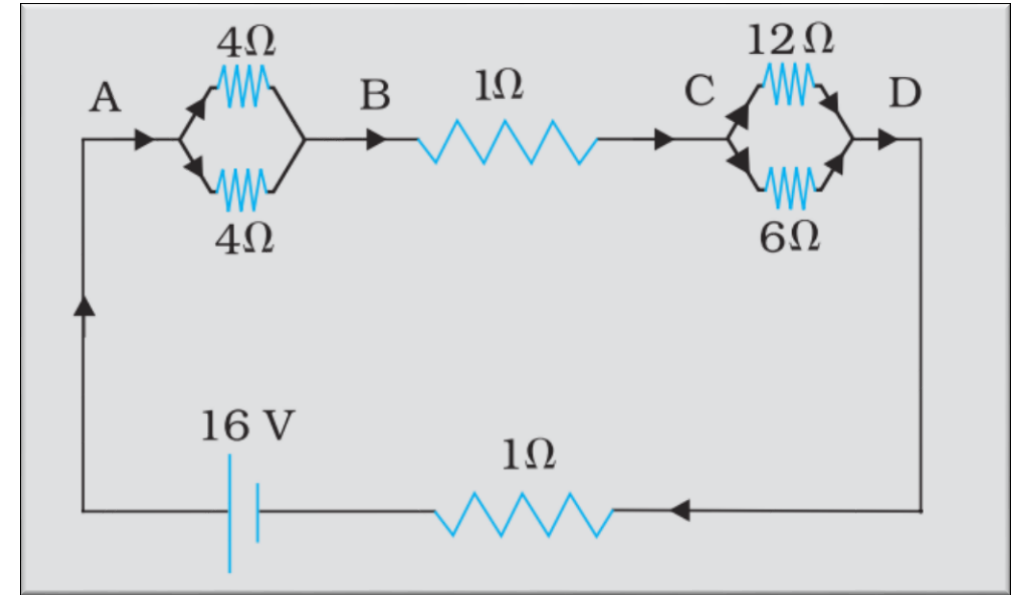
- A) 3-Phase Star
- B) 3-Phase Delta
- C) Parallel (Single-Phase)
- D) Series (Single-Phase)

Quiz 2 of 5



A network of resistors is connected to a 16 V battery with internal resistance of $1\ \Omega$, as shown below. The voltage drop V_{CD} is _____

- a) 4 V
- b) 2 V
- c) 8 V
- d) 16 V

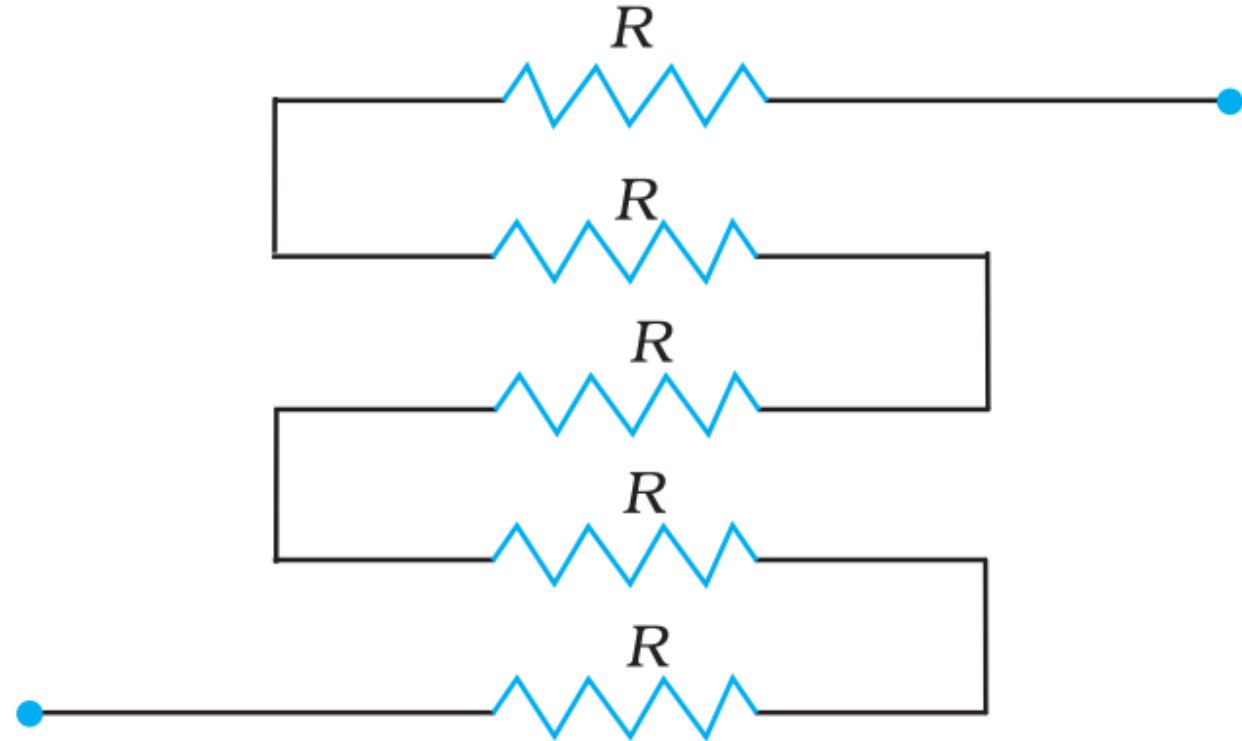


Quiz 3 of 5



In the circuit shown, the equivalent resistance of the network is _____

- A) $R/5 \Omega$
- B) $5R \Omega$
- C) $6R/5 \Omega$
- D) $2R \Omega$

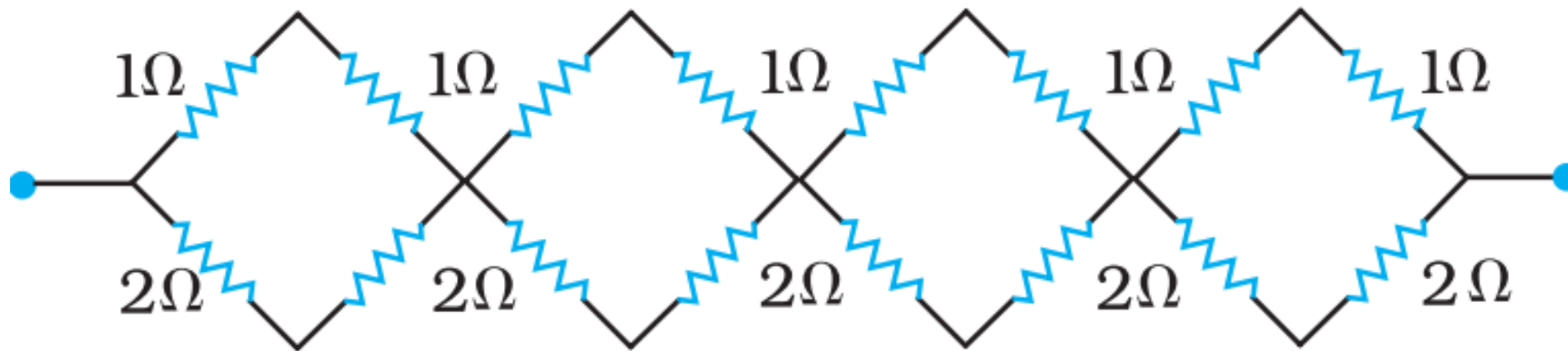


Quiz 4 of 5



The equivalent resistance of the network shown is _____

- A) $15\ \Omega$
- B) $10/3\ \Omega$
- C) $16/3\ \Omega$
- D) $15/3\ \Omega$



Quiz 5 of 5



Two electric bulbs have filaments of same thickness. When connected to the same source, one of them consumes 60 W and other one consumes 100 W. Then

- a) 60 W lamp filament has shorter length
- b) 100 W lamp filament has longer length
- c) 60 W lamp filament has longer length
- d) Both have equal length



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)



Basic Electrical Technology

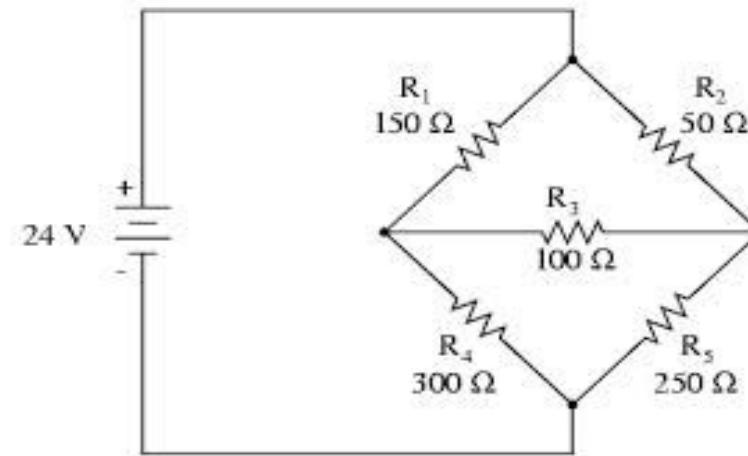
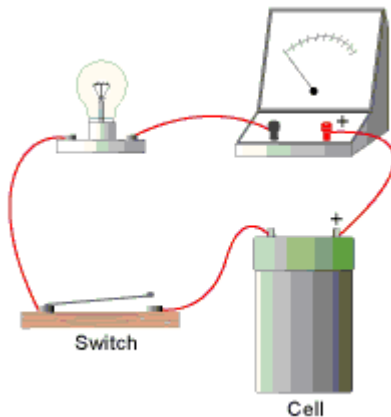
DC CIRCUIT ANALYSIS

What is an Electric Circuit?

Definition:

“An interconnection of simple electrical devices with at least one closed path in which current may flow”

- Consists of a source of electrical energy; elements that either transform, dissipate, or store this energy; connecting wires.
- To prevent power overload, circuits often include fuse or circuit breaker.



Circuit Elements



Active & Passive

- Active Elements: *Voltage & Current Sources*
- Passive Elements: *Resistor, Inductor, Capacitor*

Linear & Non-linear Elements

- Linear: *Resistor, Inductor, Capacitor*
- Nonlinear: *Diode, LDR (Light Dependent Resistor), Thermistor, transistor*

Unilateral & Bilateral Elements

- Unilateral (Current Flow in one direction): *Diode, Transistor*
- Bilateral: *Resistor, Inductor, Capacitor**

Lumped & Distributed

- Lumped elements are simplified version of distributed elements

Our study is limited to **lumped linear bilateral** circuit elements

