K. J. Somaiya College of Engineering, Mumbai-77
(Constituent College of Somaiya Vidyavihar University, Mumbai)

Semester: I **October 2021-February 2022**

In-Semester Examination

Class: F.Y. B. Tech
Branch: Computer/ IT **Semester : I**
Full name of the course: Elements of Electrical and Electronics Engineering
Course Code:116U06C107
Duration: 1hr.15 min (attempting questions) +20 min (uploading) Max. Marks: 30

SOLUTION

Q. No	Questions	
Q1	**Attempt all multiple choice questions.**	

Correct Answers are marked in red color

1. The delta network consisting of three 300 Ohms resistors can be equivalently represented by a star network of three resistors of values _____ each.

A. 600 Ohms
B. 900 Ohms
C. 150 Ohms
D. 100 Ohms

2. In the bipolar junction transistor the relative doping concentration of base, emitter and collector regions are

A. low, high and moderate respectively.
B. high, low and moderate, respectively.
C. high, moderate and low respectively.
D. moderate, low and high, respectively.

3. In the bipolar junction transistor the base emitter junction and base collector junction in saturation region is _____, respectively.

A. Forward bias and forward bias
B. Forward bias and reverse bias
C. Reverse bias and forward bias
D. Reverse bias and reverse bias

4. The cut-in voltage of silicon and germanium Zener diodes are ____ respectively.

A. 0.3 V and 0.7 V
B. 0.7 V and 0.7 V

C. 0.7 V and 0.3 V

D. 0.3 V and 0.3 V

5. In electronic switch application BJT is operated in

A. Saturation and Cut-off regions

B. Active and Saturation regions

C. Active and Cut-off region

D. Saturation, Cut-off and active regions.

6. A DC voltage source of (10 V, 2 Ohms) connected across a Load R_L. The maximum power delivered from this source to the load RL will be ___.

A. 50.0 Watts

B. 12.5 Watts

C. 100 Watts

D. 25.0 Watts

7. Under thermal equilibrium, the depletion layer of PN junction consists of

A. Only Electrons

B. Only Holes

C. Both Electrons and Holes

D. Neither Electrons nor Holes

8. An AC signal represented by $v=100 \sin(100\pi t)$ is to be rectified. The minimum peak inverse voltage rating of the diodes used in half-wave and full wave bridge rectifier must be

A. 25 V and 25 V

B. 50 V and 25 V

C. 50 V and 50 V

D. 25 V and 50 V.

Correct answer is 100 V and 100 V (Please give 1 mark if attempted)

9. In the stage common emitter BJT voltage amplifier the voltage at collector terminal measures w.r.t ground is

A. in phase with input voltage and has no DC shift.

B. in phase with input voltage and has positive DC shift.

C. out of phase with input voltage and has positive DC shift.

D. out of phase with input voltage and has zero DC shift.

10. In a common emitter single stage NPN BJT amplifier with supply voltage V_{CC} =10V. The ideal value of collector to emitter voltage (V_{CE}) in cut-off region is

A. 5.0 V

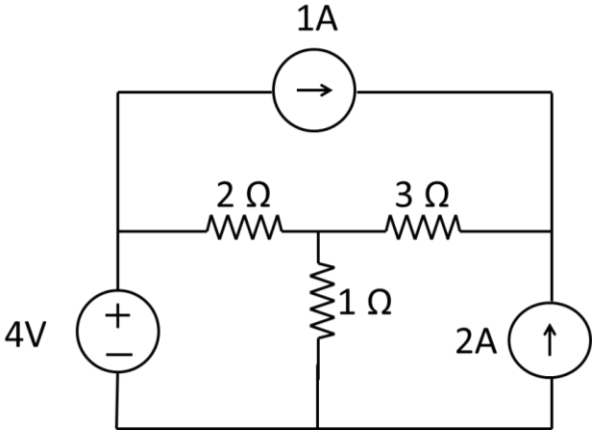
B. 15 V

C. 0.3 V

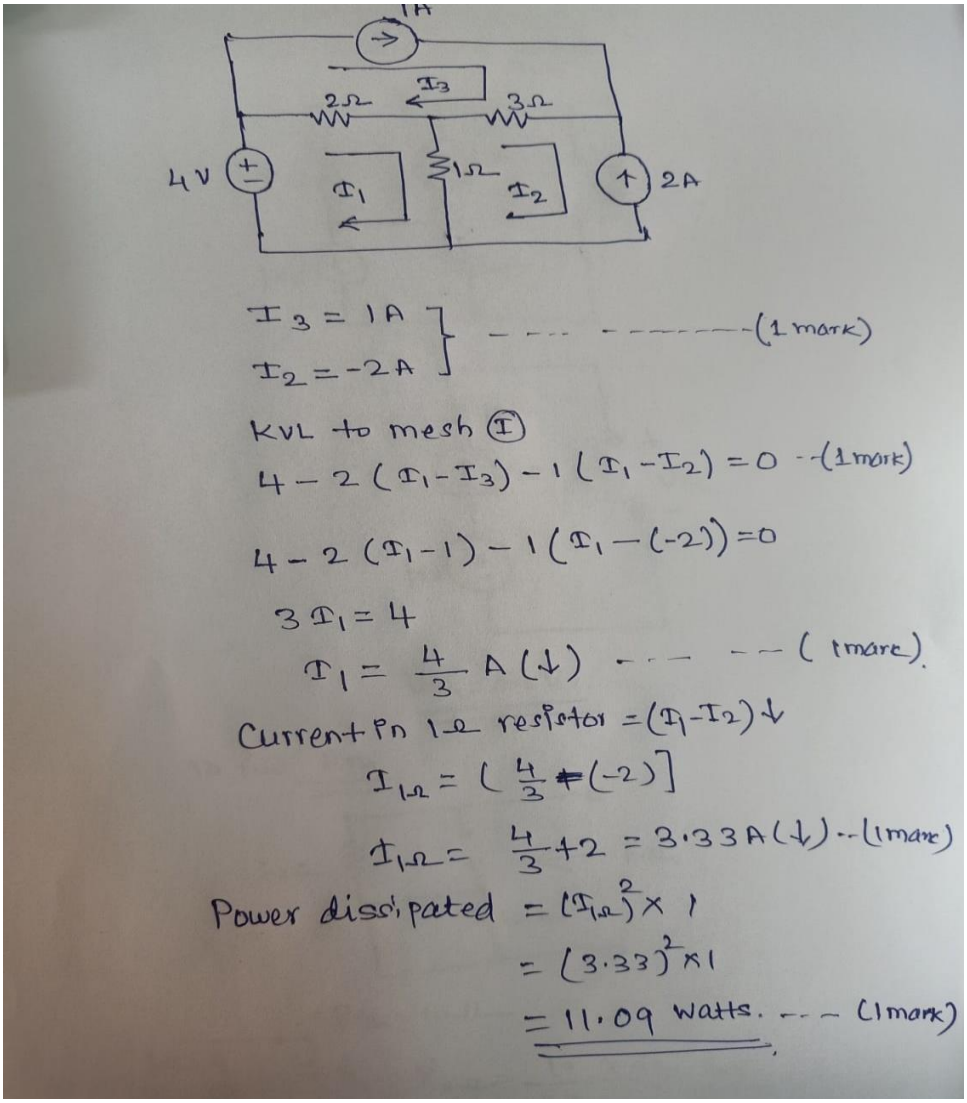
D. 10 V

Q2 **Solve Any Two of the following**

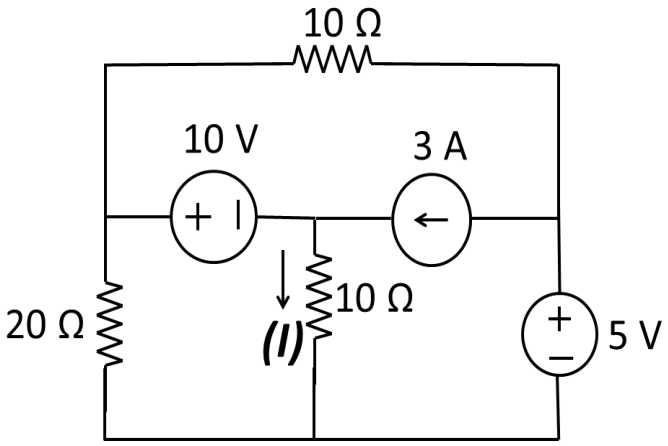
(i) Find power dissipated in 1 Ohm resistor using Mesh Analysis.



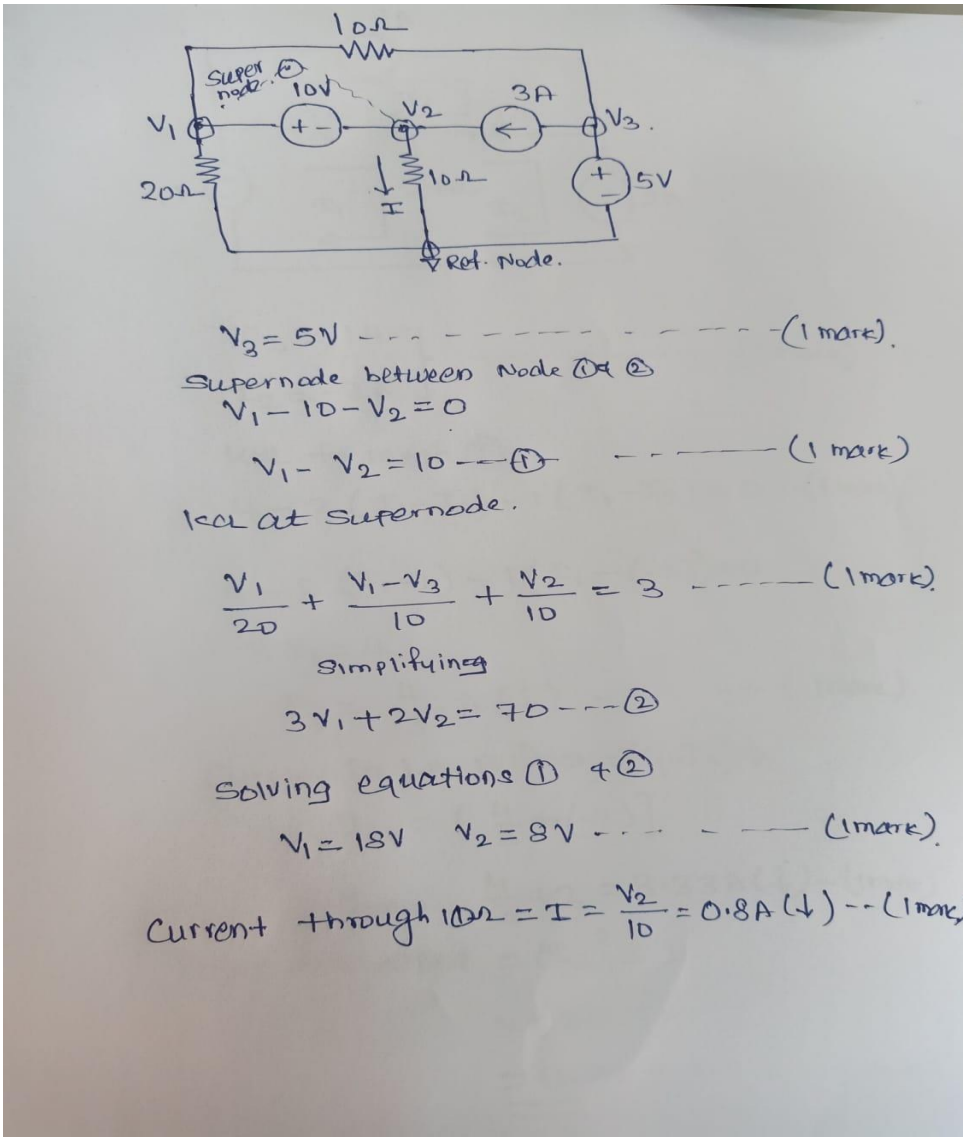
Solution :



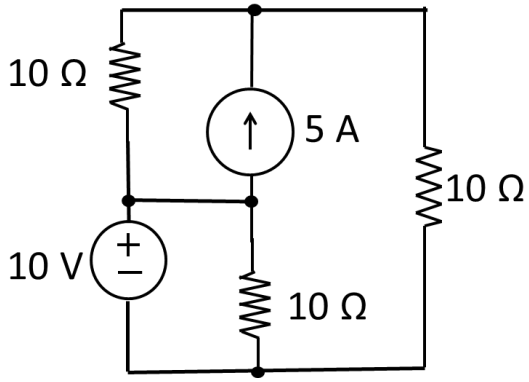
(ii) Find current (I) in the following circuit using nodal analysis.



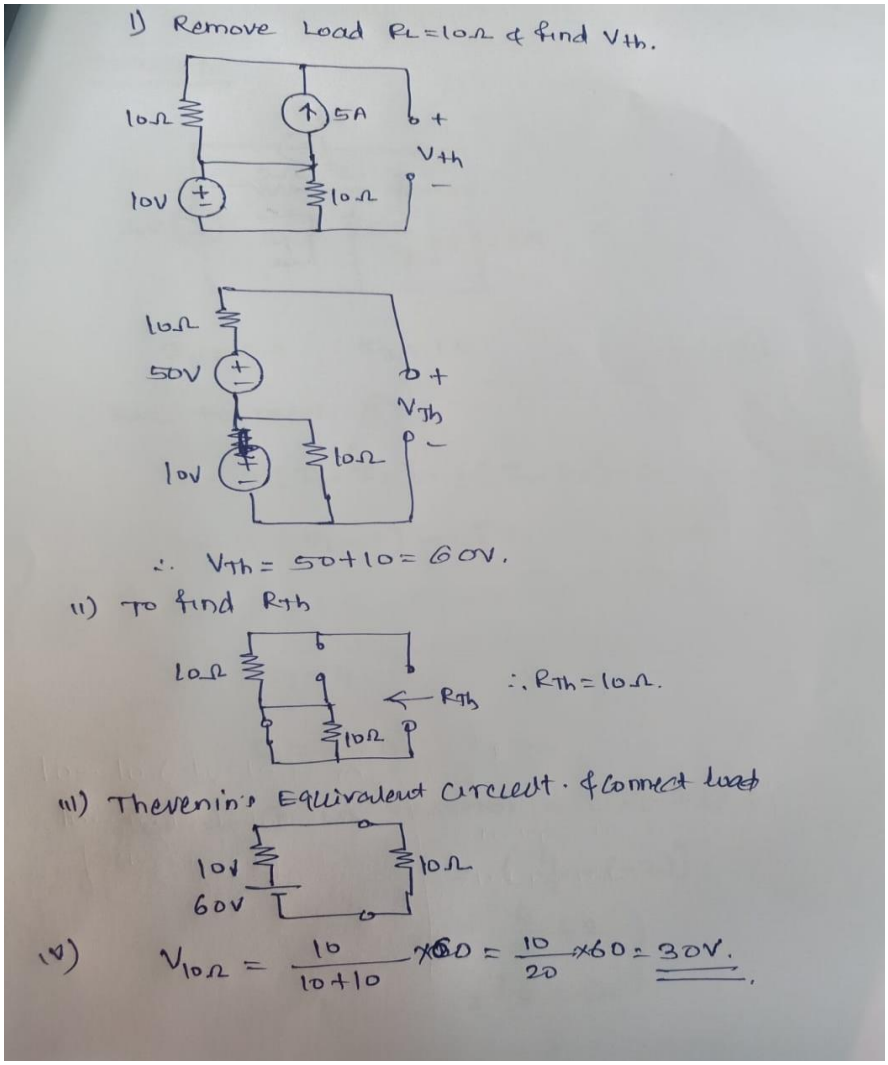
Solution:



(iii) Find Voltage across 10 Ohm resistor using Thevenin's theorem.

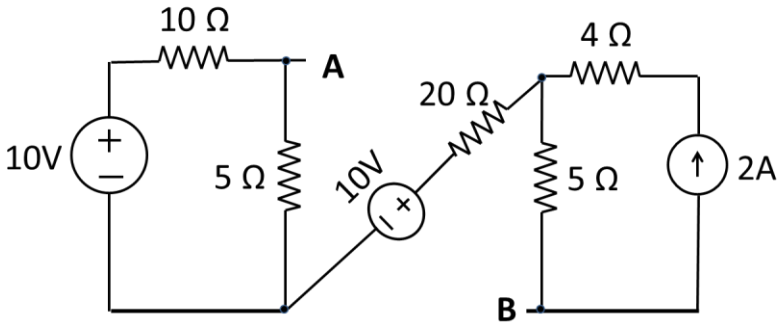


Solution: (Consider 10 Ohm resistor on extreme right. It was announced during examination in all classes)

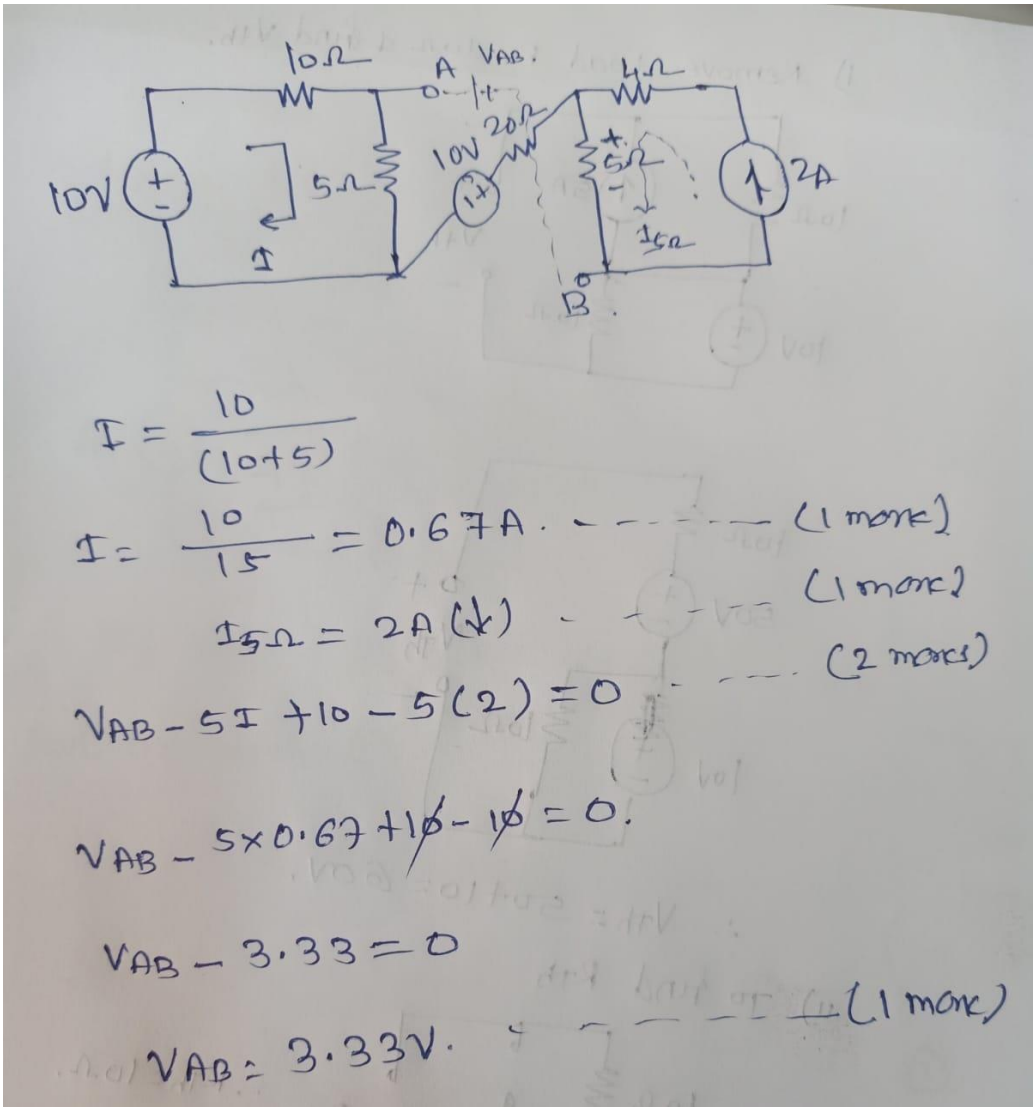


Q3 **Solve Any Two of the Following**

(i) Determine the potential difference V_{AB} in the following network.



Solution:



(ii) Draw neat circuit diagram and input/output waveforms of full wave diode rectifier with center-tapped transformer. Explain the working in brief. What are the limitations of this circuit?

Solution:

1. Circuit Diagram ----------2 Marks

2. Input/output waveforms---------- 1 Mark

3. Limitations----------2 Marks
   1. Need diodes with PIV= 2 Vm
   2. Need center-tapped transformer where tapping at exact center of secondary not possible so output may not be same during positive and negative half cycle of input.
   3. TUF is less compared to bridge rectifier

(iii) What is difference between PN Junction diode and Zener diode? Draw the circuit diagram of Zener diode based voltage regulator and explain its working. Define the terms line and load regulation.

Solution:

1. Difference ---------- 2 **Marks**

P-N junction diode	**Zener diode**
Doping concentration < 10^{16}	Doping concentration > 10^{17}
Current flow only in one direction	Current can flow in both direction
Reverse breakdown can permanently damage PN junction	Reverse breakdown is used for voltage regulation application
Width of depletion region is large due to low doping concentration	Width of depletion region is small due to low doping concentration
Avalanche breakdown in phenomenon	Zener breakdown in phenomenon
Used in rectifier circuits	Used in voltage regulator circuit

2. Circuit diagram and operation **2 mark**

3. Definition of line and load regulation **1 mark**