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VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 120018

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025

Third Semester

Biomedical Engineering

U23BM304 – FUNDAMENTALS OF CIRCUITS AND DEVICES

(Regulation 2023)

Time: Three Hours

Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Find the color coding of the 2.2 kΩ resistor.	2	K1	CO1
2.	Recall the RMS value used in representing an AC voltage.	2	K1	CO1
3.	Show the PN junction diode circuit symbol and ideal <i>i-v</i> characteristic.	2	K1	CO2
4.	Recall diffusion capacitance formation.	2	K1	CO2
5.	Name an electronic component which provides negative resistance characteristics.	2	K1	CO3
6.	Relate the uses of thyristor in electronics.	2	K2	CO3
7.	Interpret a AC signal applied around a DC bias point of a BJT.	2	K2	CO4
8.	Infer the necessity of a source follower.	2	K2	CO4
9.	List the advantages of negative feedback.	2	K1	CO5
10.	List the drawbacks of crystal oscillator.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

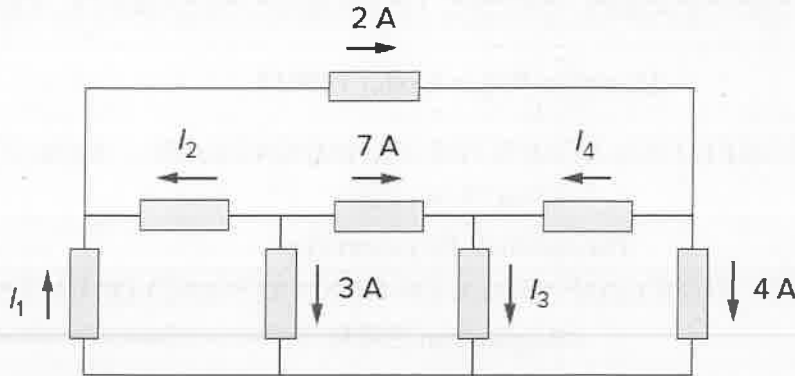
Q.No.

Questions

Marks KL CO

11. a) For the circuit in Figure, use KCL to find the branch currents I_1 to I_4 .

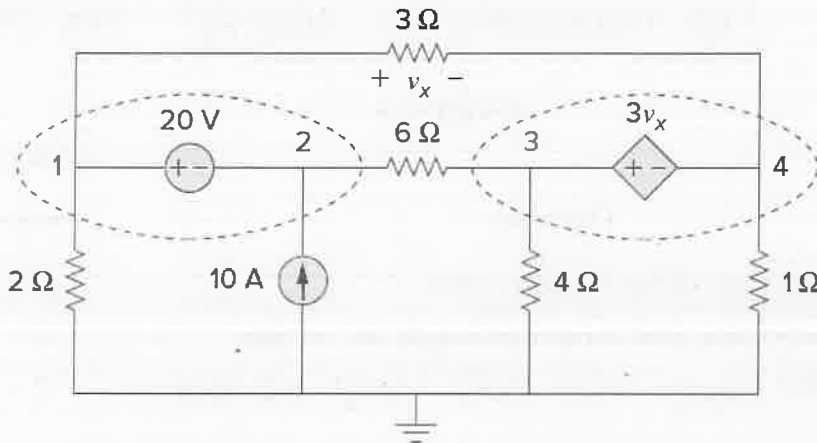
13 K1 CO1



(OR)

b) Find the node voltages in the circuit of Figure.

13 K1 CO1



12. a) i. Identify the reservoir capacitor value for a half-wave rectifier and smoothing circuit to supply 20 V to a load of 500 Ω. Maximum ripple amplitude is to be 10 % of the average output voltage, and the input frequency is 60 Hz.

6 K2 CO2

ii. Sketch the circuit of a full-wave rectifier and explain its operation. Show the output waveform that results from a sinusoidal ac input.

7 K2

(OR)

b) i. A light-emitting diode is to be used to indicate when a 25 V supply is switched on. The LED current is to be 20 mA. Construct a suitable circuit and make all necessary calculations.

6 K2 CO2

ii. Using illustrations, explain the construction and operation of light emitting diodes. Show the circuit symbol for a light-emitting diode, and show how an LED numerical display is arranged. Also discuss the current levels required by LED numerical displays.

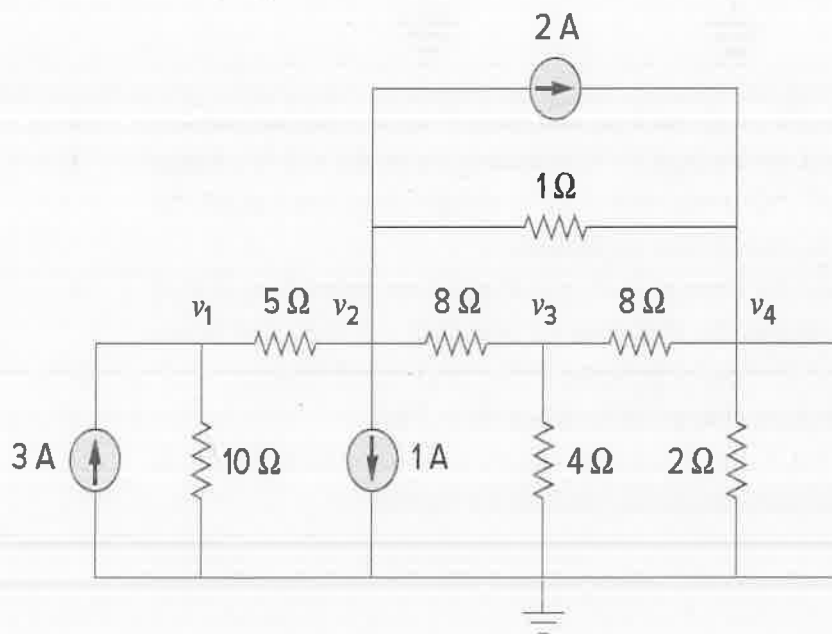
7 K2

13. a) Draw the structure of MOSFET, analyze its operation and illustrate its characteristics. 13 K2 CO3
 (OR)
 b) Draw the structure of IGBT, analyze its operation and illustrate its characteristics. 13 K2 CO3
14. a) Compare CE, CB and CC amplifiers. 13 K2 CO4
 (OR)
 b) Explain the MOSFET small signal model and its operation. 13 K2 CO4
15. a) Compare different types of feedback amplifiers. 13 K2 CO5
 (OR)
 b) Construct any two oscillator circuits to operate at 50 kHz. 13 K3 CO5

PART – C

(1 x 15 = 15 Marks)

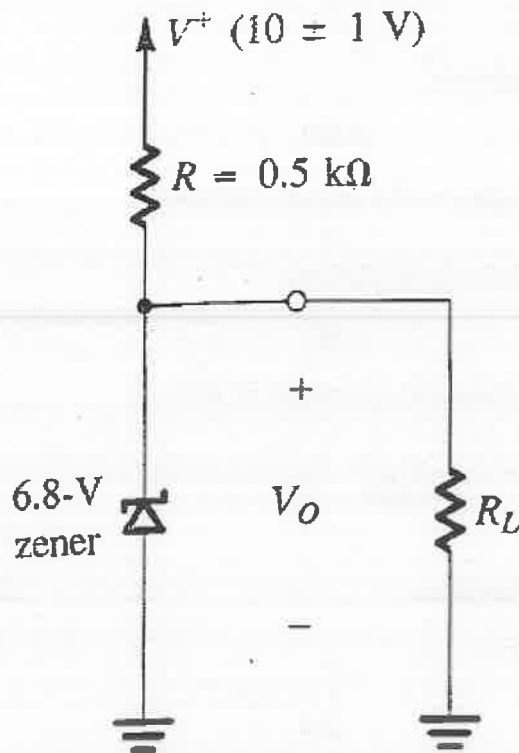
- | Q.No. | Questions | Marks | KL | CO |
|--------|-----------------------------------------------|-------|----|-----|
| 16. a) | Find the voltages v_1, v_2, v_3 and v_4 . | 15 | K1 | CO1 |



(OR)

- b) The 6.8 V zener diode in the circuit of Figure is specified to have $V_z = 6.8 \text{ V}$ at $I_z = 5 \text{ mA}$, $r_z = 20 \Omega$, and $I_{zk} = 0.2 \text{ mA}$. The supply voltage V^+ is nominally 10 V but can vary by $\pm 1 \text{ V}$.

K1 CO2



- i. Find V_0 with no load and with V^+ at its nominal value. 3
- ii. Find the change in V_0 resulting from the $\pm 1 \text{ V}$ change in V^+ . Note that $(\Delta V_0 / \Delta V^+)$, usually expressed in mV/V , is known as line regulation. 3
- iii. Find the change in V_0 resulting from connecting a load resistance R_L that draws a current $I_L = 1 \text{ mA}$, and hence find the load regulation $(\Delta V_0 / \Delta I_L)$ in mV/mA . 3
- iv. Find the change in V_0 when $R_L = 2 \text{ k}\Omega$. 3
- v. What is the minimum value of R_L for which the diode still operates in the breakdown region? 3