SASTRA

School of Electrical and Electronics Engineering

CIA II Examinations December 2022

Course Code: EEE104

Name: Principles of Electrical Engineering

Duration: 90 Min Max Marks: 50

PART – A **10 x 2 = 20 Marks**

ANSWER ALL THE QUESTIONS

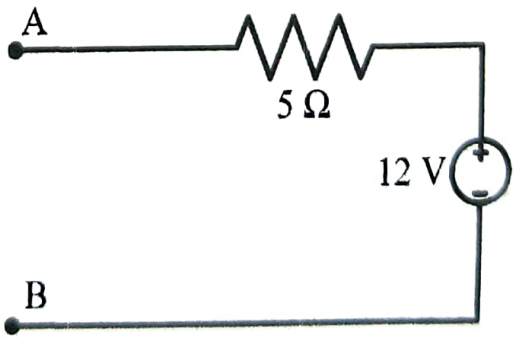
1. A 20 μF capacitor is charged to a potential difference of 400 V and then discharged through a 100000 Ω resistor. Find the initial value of discharge current.

2. Compare active and reactive power in AC circuits.

3. Write the condition for the underdamped voltage response in a series RLC circuit. $\omega_o^2 > \alpha^2$

4. How does a capacitor behave in a circuit excited by a DC source under steady-state conditions?

5. Draw the equivalent current source transformation for the following circuit.



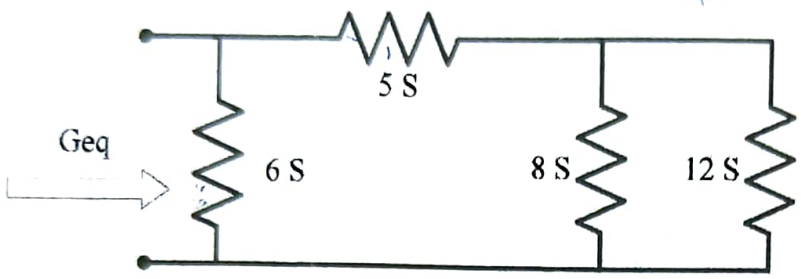
6. The non-zero average value of an alternating sinusoidal current waveform always denotes half-cycle average. Substantiate this statement.

7. For a pure inductor, L = 10mH excited by a time-varying voltage $v = 100sin\ \omega t$, calculate the current drawn when f = 50Hz and 50kHz.

8. Distinguish between mesh and loop of a circuit.

9. Draw a delta circuit using resistors, write the required expressions to transform the circuit to a star circuit.

10. Find the equivalent conductance G_{eq} of the circuit shown below.



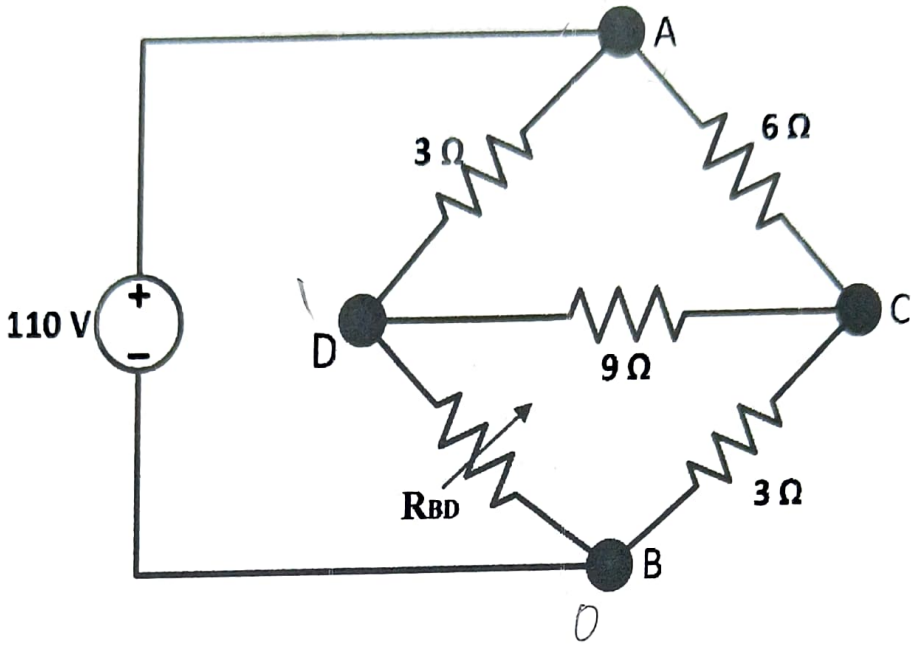
PART – B **3 x 10 = 30 Marks**

ANSWER ANY THREE QUESTIONS

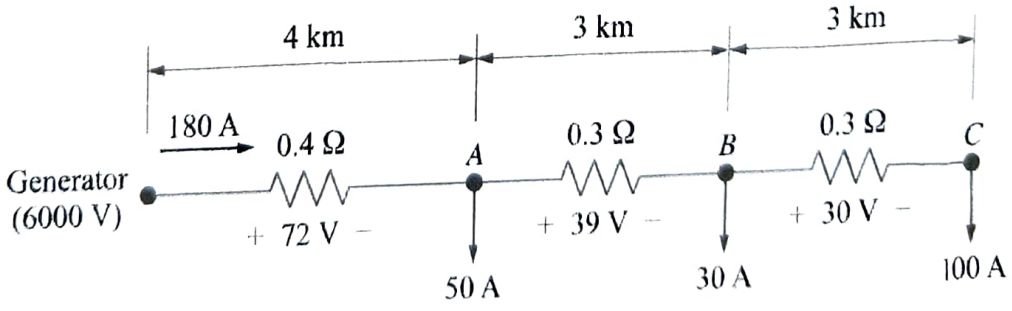
11. **A.)** A coil, having both resistance and inductance, has a total effective impedance of 50 Ω and the phase angle of the current through it with respect to the voltage across it is 45° lag. The coil is connected in series with a 40 Ω resistor across a sinusoidal supply. The circuit current is 3A. Find (i) supply voltage and (ii) circuit phase angle. (5 Marks)

B.) It has been observed that two different circuits have the same time constant of 0·005 second. The first circuit is an R-L series circuit and the second one is an R-C series circuit with a known resistance of 2 $M\Omega$. With the constant DC supply of 10 V applied to the two circuits, it is found that steady-state current of the circuit is 2000 times the initial current of the circuit. Find unknown resistor, inductor and capacitor values. (5 Marks)

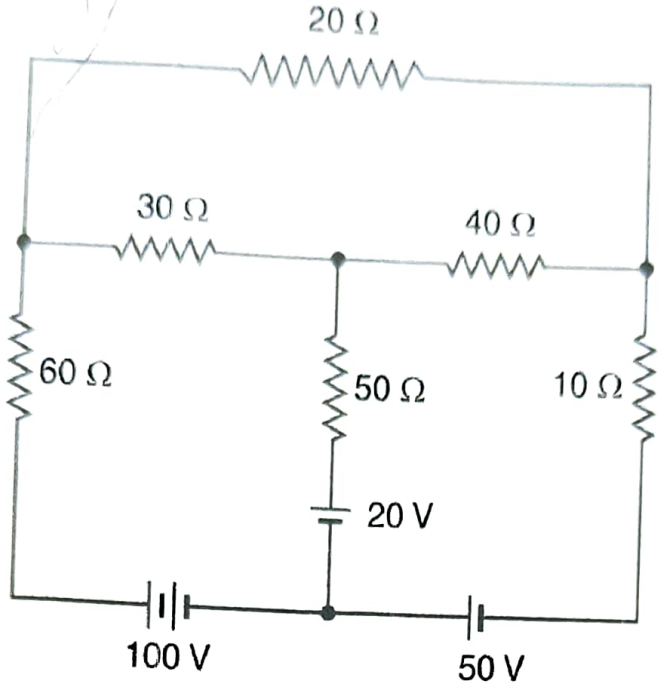
12. Find out the value of R_{BD} for maximum power transfer in the circu given below and the actual power dissipated in R_{BD}. (10 Marks)



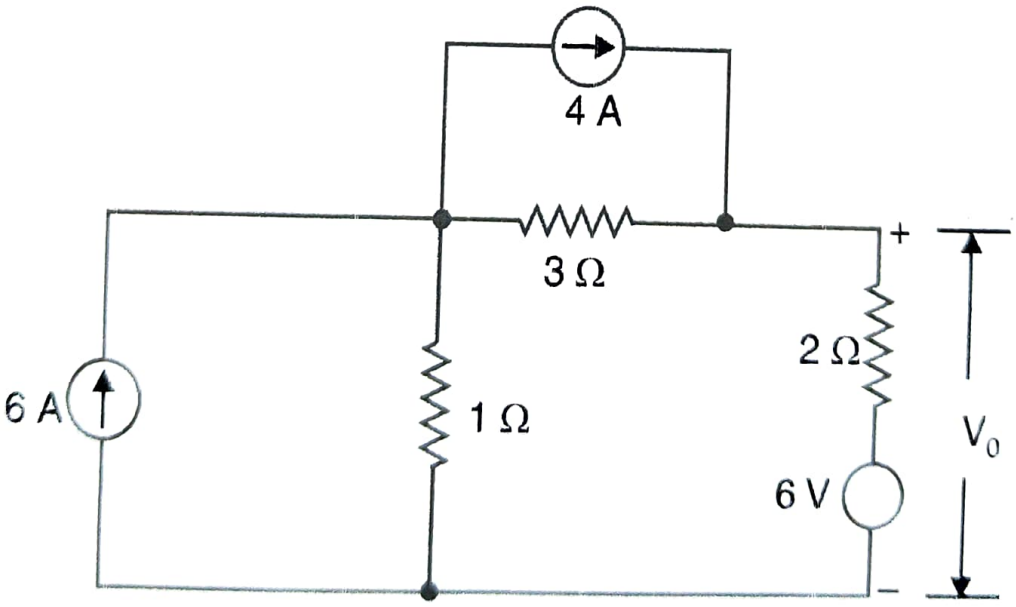
13. A.) A power transmission line carries current from a 6000-V generator to three loads, A, B, and C. The loads are located at 4, 7, and 10 km from the generator and draw 50, 30, and 100 A, respectively. The resistance of the line is 0.1 Ω/km. Find the voltage at loads A, B, C and the the maximum percentage voltage drop from the generator to a load. (5 Marks)



B.) Find the current and power in each branch using mesh analysis. (5 Marks)



14. Using superposition theorem, find the value of output voltage V_0 in the circuit shown below. (10 Marks)



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