Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION – JAN 2023

Course Code: EEE 2002

Course Name: Electric Circuit Analysis

Program : B. Tech - EEE

Date: 23-JAN-2023

Time: 09:30 AM – 12:00 PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) Read the question properly and answer accordingly.

(ii) Scientific and non-programmable calculators are permitted.

Part A (Memory Recall Questions)

Answer any Ten questions. Each question carries TWO mark. (10Qx2M=20M)

1. A three-phase system is said to be balanced if, a) the voltages in the three phases are equal in magnitude and differ in phase from one another by 120°, b) currents in the three phases are equal in magnitude and differ in phase from one another by 120° and c) loads connected across the three phases are identical. A 3 phase load is balanced if all the three phases have the same------ (C.O.No.5) [Knowledge]

a) Impedance
b) Power Factor
c) Impedance and Power factor
d) None of the above

2. A circuit containing reactance is said to be in resonance if the voltage across the circuit is in phase with the current through it. The impedance at the resonant frequency of a series RLC circuit with L = 20 mH, C = 0.02 μF, and R = 100 Ω is (C.O.No.4) [Knowledge]

a) 0 Ω
b) 100 Ω
c) 20 Ω
d) 40 Ω

3. The principle of superposition helps us to analyze a linear circuit with more than one independent source by calculating the contribution of each independent source separately. What should be done, if the dependent current and voltage sources are present in a circuit while applying 'Superposition Theorem? (C.O.No.2) [Knowledge]

a) Replace them by open circuit
b) Replace them by short circuit
c) Keep in their original form without replacing by either open or short circuits
d) None of the above

4. The constant current of 10A is passed through 1mH inductor for 10 sec. The value of voltage across the inductor is _____ (C.O.No.1) [Knowledge]

a) 1 Mv
b) Zero.
c) 2mV
d) Infinity

5. In a linear bilateral circuit consists of two independent voltage sources and three resistances. The current passing through one resistance when one voltage source active is 2A and another source active is 5A. The total current passing through the resistance, according to super position theorem is _____ (C.O.No.3) [Knowledge]

a) 7A
b) 3.5A
c) 3A
d) 10A

6. A lead acid battery of 12V dc is connected to a series RC circuit with a switch. Initially capacitor is uncharged. The switch is closed at t=0. Comment on the behavior of capacitor immediately after closing the switch (C.O.No.3) [Knowledge]

a) Short circuit
b) Open circuit
c) Short circuit with current source
d) Open circuit with voltage source

7. In Superposition theorem, while considering a voltage source, all other current sources are ---------- (C.O.No.2) [Knowledge]

a) Open circuited
b) will remain as current source
c) short circuited
d) data is insufficient

8. The individual Z parameters for a given network can be defined by setting each of the port currents equal to ---- (C.O.No.5) [Knowledge]

a) Zero, Zero
b) zero, infinity
c) infinity,zero
d) infinity,infinity

9. The circuit has resistors, capacitors and semiconductor diodes. The circuit will be known as

(C.O.No.1) [Knowledge]

a) Non-linear circuit
b) Bilateral circuit
c) Linear circuit
d) None of the above

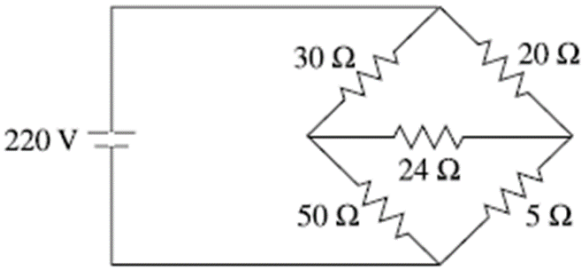
10. At steady state, the current in the inductor is? (C.O.No.4) [Knowledge]

a) Maximum
b) Minimum
c) Zero
d) Infinity

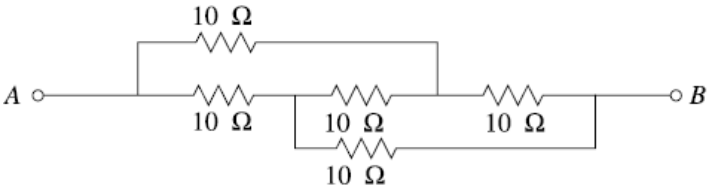
Part B (Thought Provoking Questions)

Answer any Five questions. Each question carries TEN marks. (5Qx10M=50M)

11. A Wheatstone bridge is used for the accurate measurement of medium resistance by using null deflection principle. Obtain the current through the galvanometer, having a resistance of 24ohms in the unbalanced Wheatstone bridge as shown in figure by applying suitable network theorem. (C.O.No.3) [Comprehension]

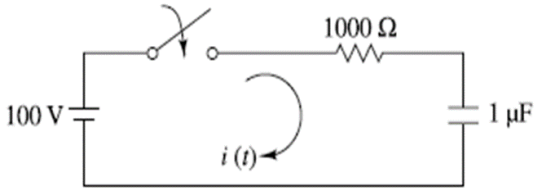


12. When a circuit cannot be simplified by normal series–parallel reduction technique, the star-delta transformation can be used. These two networks will be electrically equivalent if the resistance as measured between any pair of terminals is the same in both star and delta arrangements. Simply the network given in figure using suitable transformations to find an equivalent resistance between A and B.



(C.O.No.1) [Comprehension]

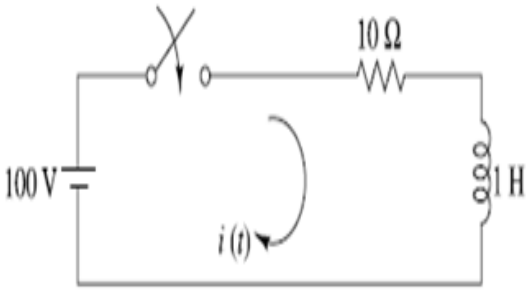
13. An RC circuit can be used to provide various time delays. The warning blinkers commonly found on road construction sites are one example of the usefulness of such an RC delay circuit. For the series RC circuit given in figure, the switch is closed at t=0, with inductor uncharged in prior. Comment on the behavior of capacitor immediately after closing the switch and obtain the value of second derivative of capacitor current with respect to time at t=0+



(C.O.No.4) [Comprehension]

14. In a delta connected network, dissimilar terminals of the three windings are joined together, i.e., the 'finish' terminal of one winding is connected to the 'start' terminal of the other winding, and so on. For a balanced system, the sum of the three phase voltages round the closed mesh is zero. The three emfs are equal in magnitude but differ in phase from one another by 120°. A balanced delta-connected load of impedance (8 – j6) ohm per phase is connected to a three-phase, 230-V, 50-Hz supply. Identify the unknown parameters that can be calculated from the given data and compute the same (C.O.No.5) [Comprehension]

15. A series RL circuit is used as a choke coil to protect the circuit form sudden changes of current as shown in Fig. 2. Assume all initial conditions are zero. Comment on behavior of circuit at steady state and expression for current.

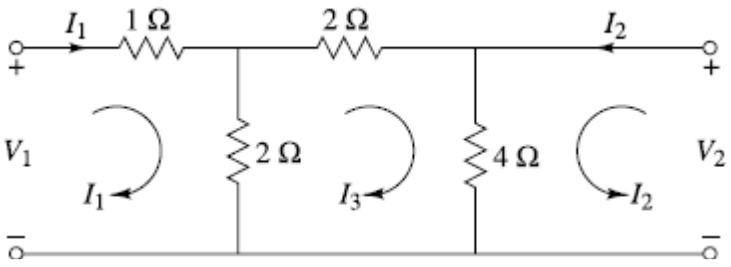


(C.O.No.4) [Comprehension]

Part C (Problem Solving Questions)

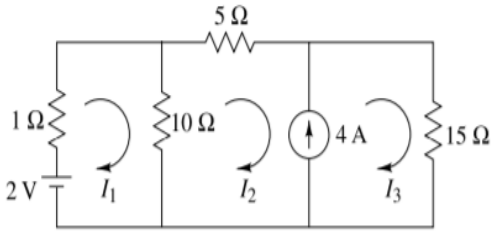
Answer any two questions. Each question carries FIFTEEN marks (2Qx15M=30M)

16. A two-port network is an electrical network with two separate ports for input and output. They are useful in communications, control systems, power systems, and electronics. For example, they are used in electronics to model transistors and to facilitate cascaded design. Second, knowing the parameters of a two-port network enables us to treat it as a "black box" when embedded within a larger network. Determine hybrid parameters of the network shown in figure and check whether the given network is reciprocal or not



(C.O.No.5) [Comprehension]

17. In mesh analysis, the currents in different meshes are assigned continuous paths so that they do not split at a junction into branch currents. If a network has a large number of voltage sources, it is useful to use mesh analysis. But the meshes that share a current source with other meshes, none of which contains a current source in the outer loop, form a super mesh. Find the voltage across 10ohm resistor by using super mesh analysis



(C.O.No.1) [Comprehension]