

Total No. of printed pages = 12

END SEMESTER EXAMINATION - 2019

Semester : 4th

Subject Code : CAI-401

BASIC ELECTRICAL CIRCUITS*

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. All questions of PART-A are compulsory.
2. Answer any five questions from PART-B.

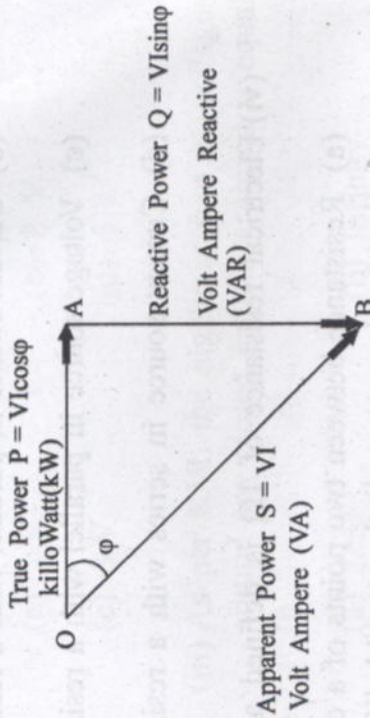
PART - A

Marks - 25

1. Choose the correct answer : $1 \times 15 = 15$
 - (i) If there are three (3) Resistors 20Ω , 20Ω and 10Ω in series and 5 V is the input voltage to this series combination and "i" is total current then voltage across 10Ω is
 - (a) 1 V
 - (b) 2 V
 - (c) 3 V
 - (d) 5 V

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(vii) The relationship among True Power(P), Apparent Power (S) and Reactive Power(Q) can be expressed as



- (a) $S = P + jQ$ (b) $S^2 = P^2 + Q^2$
 (c) $S = \sqrt{P^2 + Q^2}$ (d) All of these

(viii) Power Factor is defined as

- (a) the cosine of angle between the voltage and current phasor
 (b) the ratio of active power and apparent power

- (c) Both (a) and (b) above
 (d) None of these

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(ix) The resistance R of a conductor depends on

- (a) its length
 (b) its cross-sectional area
 (c) temperature
 (d) All of the above

(x) The SI Unit of power is

- (a) Watt
 (b) Horsepower (hp)
 (c) Ergs per second (erg/s)
 (d) Foot-pounds per minute

(xi) Among the following, which is the right formula for inductance ?

- (a) $V = L \frac{di}{dt}$
 (b) $L = V \frac{di}{dt}$
 (c) $V = L \frac{dt}{di}$
 (d) None of these

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(5)



(xii) If either the inductance or the rate of change of current is doubled, the induced emf

- (a) remains constant
- (b) becomes zero
- (c) becomes double
- (d) becomes half

(xiii) If the current changes from 5A to 3A in "x" sec and inductance is 10H, the emf is 10V, the value of x is

- (i) 2s
- (ii) 3s
- (iii) 4s
- (iv) 5s

(xiv) In superposition theorem, when we consider the effect of one voltage source, all the other voltage sources are

- (a) shorted
- (b) opened
- (c) removed
- (d) undisturbed

(xv) Mesh analysis employs the method of _____.

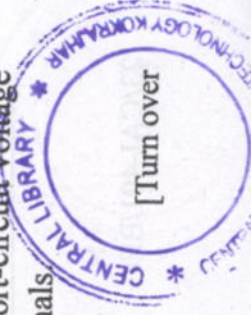
- (a) KCL
- (b) KVL
- (c) Both KCL and KVL
- (d) Neither KCL nor KVL

2. Read the following statements. Write True or False against each : $1 \times 5 = 5$

- (a) A capacitor consists of two conductors connected in parallel to each other so that it can store charge in between the plates.
- (b) Capacitance is directly proportional to plate area. Hence as the plate area increases, the capacitance also increases.
- (c) Conductors are materials (mostly metals), which freely allow the passage of electrons through it.
- (d) Thevenin's voltage is the short-circuit voltage across the specified terminals.



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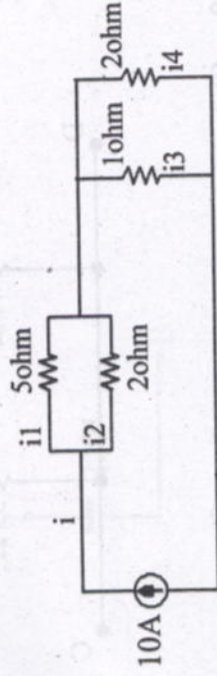
(e) This average current is obtained by squaring all the current values, finding the average and then finding the square root.

3. Match the following resistance values in Column A with the correct colour coding from Column B. $1 \times 5 = 5$

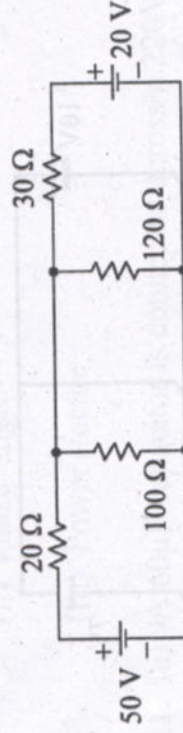
Column - A	Column - B
(i) 1Ω ; 5% tolerance	(a) Yellow-Brown-Red-Silver
(ii) 21Ω ; 5% tolerance	(b) Green-Green-Green-Silver
(iii) $4.1\text{ k}\Omega$; 10% tolerance	(c) Red-Red-Red-Gold
(iv) $5.5\text{ M}\Omega$; 10% tolerance	(d) Black-Brown-Black-Gold
(v) $2.2\text{ k}\Omega$; 5% tolerance	(e) Red-Brown-Black-Gold

PART - B
Marks - 45

4. Find i , i_1 , i_2 , i_3 and i_4 in the following network : 9

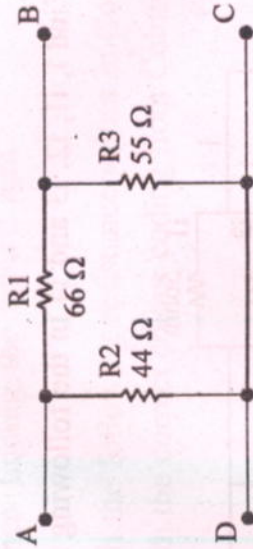


5. Prove that the current flowing through 100 ohm resistance in the circuit configuration of the above figure is 311.8 mA , using Mesh Analysis. 9



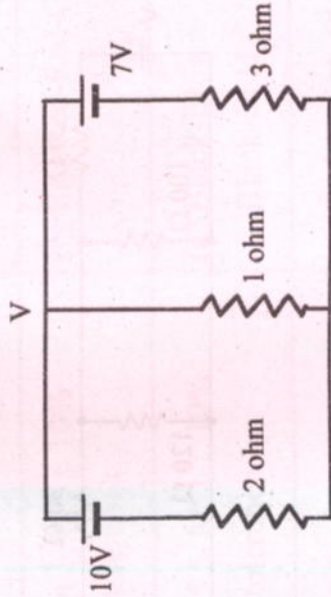
6. Verify the answer of the previous question (Q.No.5) by Thevenin's theorem. 9

7. Convert the following delta to its equivalent star connection : 9



8. State and prove the "Maximum Power Transfer Theorem" mathematically as applicable to DC networks. 9

9. Find the node voltage V in the following circuit : 9



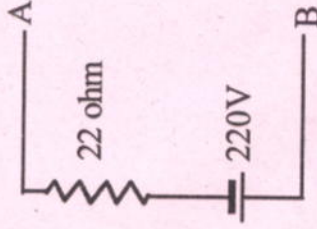
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(10)

50(W)



10. (a) Apply source transformation technique to the following network : 3



- (b) A coil having a resistance of 5 ohm and inductance of 26.5 mH are connected to a 220V, 50Hz supply. Calculate : 6

- (i) Circuit current
(ii) Phase angle
(iii) Power factor

11. (a) A $60\mu\text{F}$ capacitor is connected across a 220V, 50Hz supply. Calculate the reactance offered by the capacitor and maximum current. 4

- (b) Define the following terms : $1 \times 5 = 5$

- (i) Branch, (ii) Mesh, (iii) Loop,
(iv) Unilateral circuit, (v) Junction.

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(11)

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12. Write short notes on any *three* of the following : 3×3=9

- (i) Power factor
- (ii) Resonance
- (iii) Ohm's Law
- (iv) Form factor.

