Total No. of printed pages = 10

END SEMESTER EXAMINATION – 2020

Subject Code : CAI-401

BASIC ELECTRICAL CIRCUITS

Full Marks – 70

Time – Three hours

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

The Question Paper consists of two parts : Part – A and Part – B. Both are compulsory.

PART – A

Marks – 25

(*All* questions are compulsory.)

1. Choose the correct answer : 1×15=15

   (a) According to KVL, the algebraic sum of all IR drops and emfs in any closed loop of a network is always

   (i) zero

   (ii) positive

   (iii) negative

   (iv) determined by battery emfs

(b) EMF in a circuit

(i) increases circuit resistance

(ii) decreases circuit resistance

(iii) maintains potential difference

(iv) None of the above

(c) The value of α (temperature co-efficient of resistance) depends on

(i) length of material

(ii) x-sectional area of the material

(iii) volume of the material

(iv) nature of the material and temperature

(d) The filament of an electric bulb is made of

(i) Tungsten

(ii) Nickel

(iii) Aluminium

(iv) Silver

(e) A DC circuit usually has _____ as load.

(i) resistance

(ii) inductance

(iii) capacitance

(iv) Both inductance and capacitance

(f) Electrical appliances are not connected in series because

(i) series circuit is complicated

(ii) power loss is more

(iii) appliances have different current ratings

(iv) None of the above

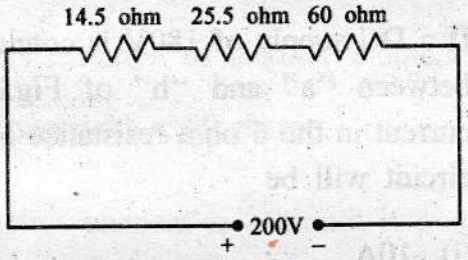


Fig.1

(g) Voltage drop across 14.5 ohm resistance in the above Fig.1 is

(i) 29 V (ii) 30.5 V

(iii) 14 V (iv) 18 V

(j) An electric fan and a heater are marked as 100W, 220V and 1000W, 200V respectively. The resistance of heater is

(i) zero

(ii) greater than that of fan

(iii) less than that of fan

(iv) equal to that of fan

(k) Kirchoff's current law at a junction deals with

(i) conservation of energy

(ii) conservation of momentum

(iii) conservation of angular momentum

(iv) conservation of charge

(l) An active element in a circuit is one which

(i) receives energy

(ii) supplies energy

(iii) both receives and supplies energy

(iv) None of the above

(h) When cells are arranged in parallel

(i) the current capacity increases

(ii) the current capacity decreases

(iii) the EMF increases

(iv) the EMF decreases

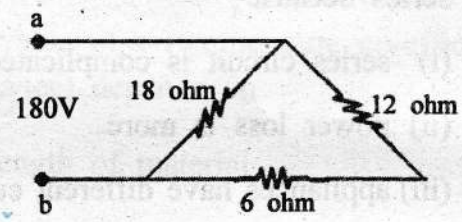


Fig. 2

(i) If a DC supply of 180V is connected across between "a" and "b" of Fig.2, then the current in the 6 ohm resistance of the above circuit will be

(i) 10A

(ii) 5A

(iii) 12A

(iv) 6A

(m) In the circuit shown below (Fig.3), there are _____ junctions.

(i) Three (ii) Four

(iii) Two (iv) None of these

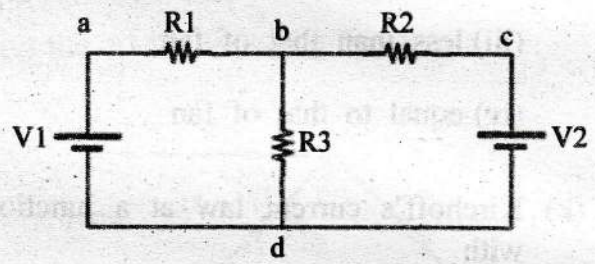


Fig. 3

(n) The circuit of Fig.3 has _____ branches.

(i) Two (ii) Four

(iii) Three (iv) None of these

(o) The circuit of Fig.3 has _____ loops.

(i) Two

(ii) Four

(iii) Three

(iv) None of the above

2. Write "true" or "false" : 1×5=5

(i) Norton's theorem is the converse of Thevenin's theorem.

(ii) Under the conditions of maximum power transfer the efficiency is 50%.

(iii) Delta/Star or Star/Delta transformation technique is applied to two terminal networks.

(iv) The node-equation method is based directly on Kirchhoff's current law.

(v) A real voltage source can be converted to an equivalent real current source and vice-versa.

3. Match the resistor values in Column – A with the correct colour coding from Column – B. 1×5=5

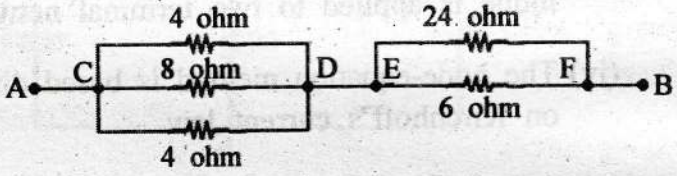
Column – A	Column – B
(i) 200 Ω	(a) Green-Violet-Brown
(ii) 43 Ω	(b) Yellow-Violet-Red
(iii) 570 Ω	(c) Yellow-Orange-Black
(iv) 6 KΩ	(d) Red-Black-Brown
(v) 4.7 KΩ	(e) Blue-Black-Red

PART – B

Marks – 45

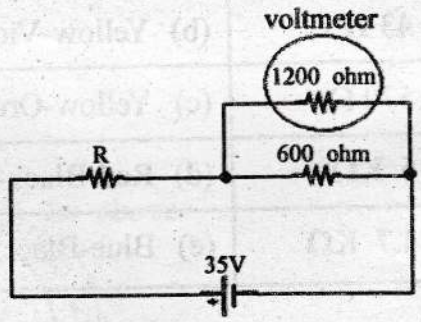
Answer any *five* questions. 9×5=45

4. (a) A battery having emf of 12V is connected across terminals AB of the circuit. Find (i) current flowing in each resistance and (ii) total power absorbed by the circuit. 6

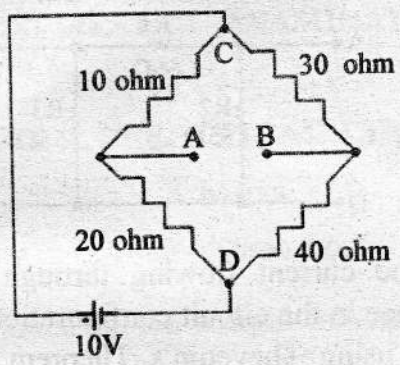


(b) State and explain Kirchhoff's laws. 3

5. (a) A 35V DC supply is connected across a resistance of 600 ohm in series with an unknown resistance R. A voltmeter having a resistance of 1200 ohm is connected across 600 ohm and shows a reading of 5V. Find the value of resistance R. 5



(b) Find the voltage V_{AB} in the following circuit : 4



6. Prove that for a sinusoidal current

(a) $I_{rms}=0.707I_m$

(b) $I_{av}=0.637I_m$ 9

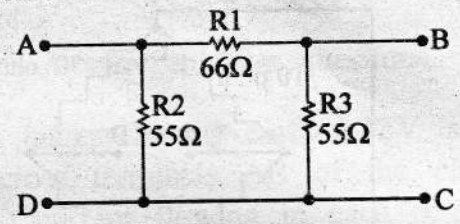
7. (a) In a pure resistive circuit the instantaneous voltage and current are given by

$v = 250 \sin 314t$; $i = 10 \sin 314t$

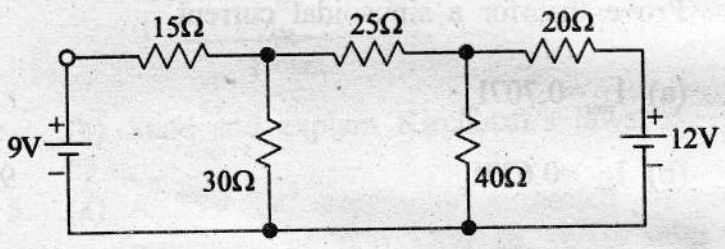
Determine the peak power and the average power. 4

(b) Prove that power absorbed in a pure capacitance in an AC circuit is zero. 5

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



9. Find the current flowing through the 25 ohm resistance in the circuit configuration of the figure below, using Thevenin's Theorem. 9



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

11. Write short notes on : 3×`3=9

(a) Power factor

(b) Resonance

(c) Form and Peak Factor