Ref. No.: Ex/PE/T/126/2018

B. POWER ENGINEERING EXAMINATION -2018

(1^{st} Year – 2^{nd} Semester)

SUBJECT – Circuit Theory

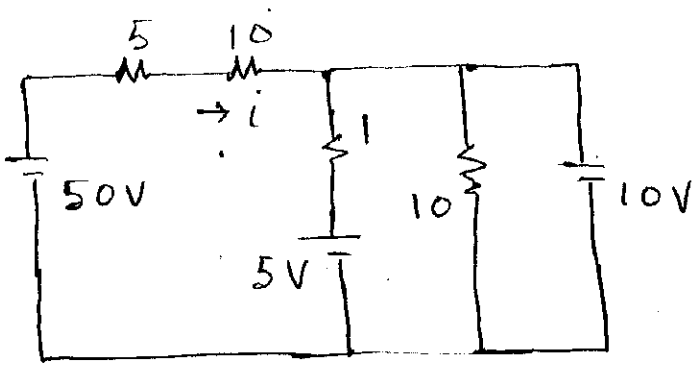
Time: Three hours | Full Marks: 100

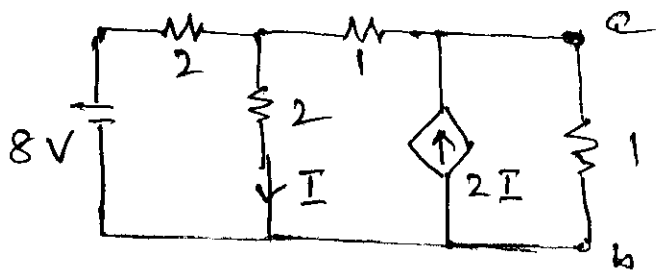
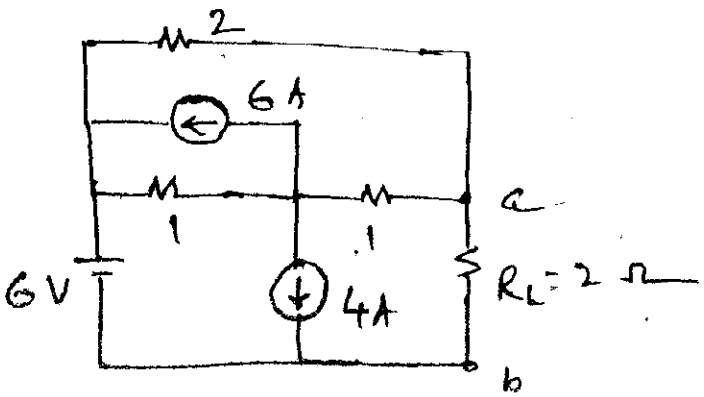
Answer any ***seven*** questions

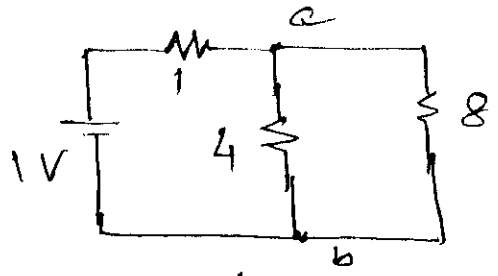
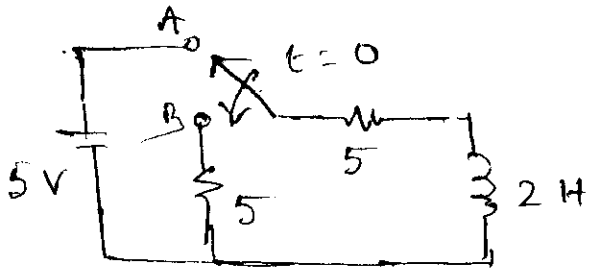
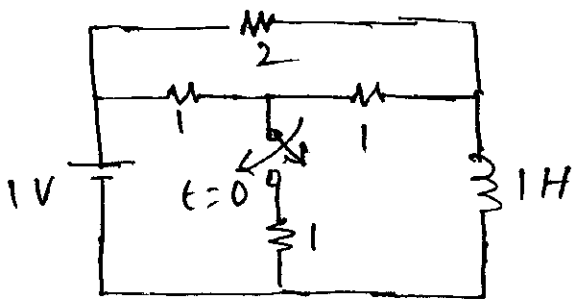
Assume suitable value for missing data, if any

All the values of resistors are in Ω.

All parts of a question to be answered at one place.

No. of Question		Marks
Q. 1. (a)	Define and explain the following with suitable examples: (i) Isomorphic graphs (ii) Cut set and fundamental cut set (iii) Even function symmetry of periodic functions	3+2+2
(b)	The incidence matrix of a directed graph is given below. Draw the directed graph. Also, write down the fundamental cut set matrix for a particular tree of your choice. $[A] = \begin{bmatrix} -1 & 0 & 0 & -1 & 1 & 0 \\ 0 & 1 & 0 & 0 & -1 & -1 \\ 0 & 0 & -1 & 1 & 0 & 1 \\ 1 & -1 & 1 & 0 & 0 & 0 \end{bmatrix}$	7
2. (a)	For the network as shown in fig 1, draw the directed graph and write down the fundamental tie set matrix for a particular tree of your choice. Use it to determine the current *i*.  fig. 1	14

3.	Determine the two parameters, power consumed by the circuit and the power factor of the circuit whose expression for the voltage and currents are as follows: $v(t) = 269 \sin(314t + 10°) + 79 \sin(942t + 48°)$ $i(t) = 19.8 \sin(314t - 47°) + 2.2257 \sin(942t - 29.7°)$	14
4.	Discuss the half wave symmetry of a periodic function with suitable example. Hence show that Fourier Series of periodic function having half wave symmetry contains only odd harmonics.	4 +10
5. (a)	State and explain Norton's Theorem with suitable example.	4
(b)	Find the current through the 1.0 Ω resistance connected between the terminals *a* and *b* for the network as shown in fig. 2 using Norton's Theorem.  fig. 2	10
6. (a)	State and explain Superposition Theorem with suitable example.	4
(b)	Determine the current through the resistance R_L = 2 Ω for the network as shown in fig.3 using Superposition Theorem.  fig. 3	10

7. (a)	State and explain Compensation Theorem with suitable example.	4
(b)	Consider the network shown as fig.4. The value of resistance connected between terminals a and b is changed from *4* Ω to 2 Ω. Verify the compensation theorem	10
	 fig. 4	
8. (a)	State and prove initial value theorem and final value theorem.	7
(b)	For the network shown as fig. 5, the switch is thrown from position A to position B at time $t = 0$, the current having previously reached its steady state value. Determine the current through inductor after switching.	7
	 fig. 5	
9.	Consider the circuit shown as fig. 6 below. The circuit is initially at state with the switch *S* open. At $t = 0$, the switch is closed. Obtain the expression for current through the inductor.	14
	 fig. 6	

10.	Find the *y*-parameters and *h*-parameters for network as shown in fig.7 below.	7+7

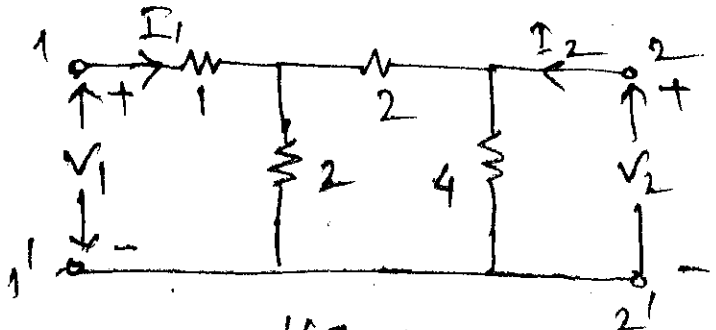


fig. 7