Ref. No.: Ex/PE/T/126/2019 (Old)

B. POWER ENGINEERING EXAMINATION -2019 (Old)

(1^{st} Year – 2^{nd} Semester)

SUBJECT – Circuit Theory

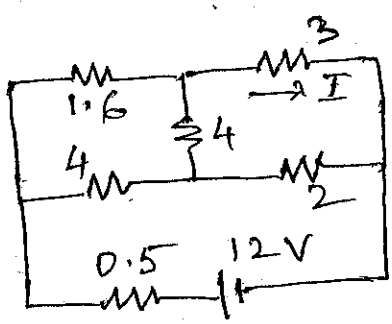
Time: Three hours | Full Marks: 100

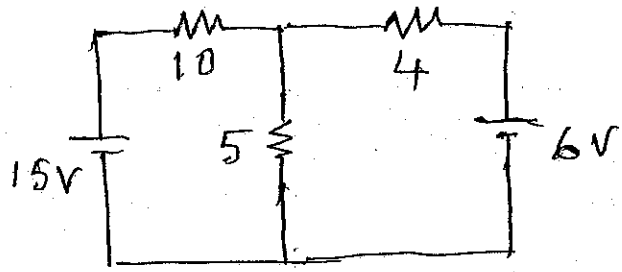
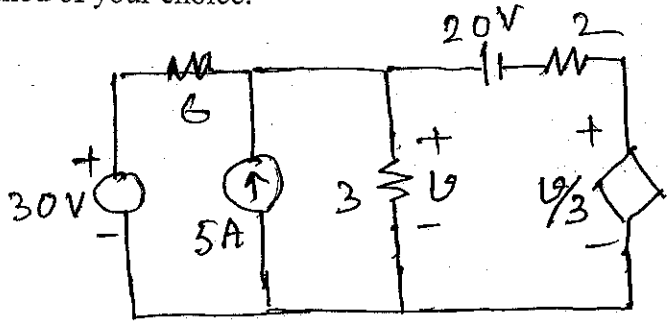
Answer any ***seven*** questions

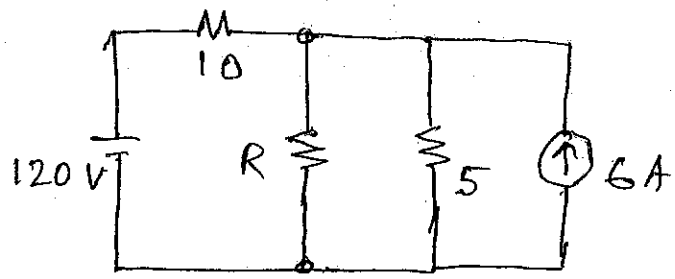
Assume suitable value for missing data, if any

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) Fundamental Tie set and fundamental Tie set Matrix (ii) Tree and Co-tree of a graph (iii) Odd function symmetry of periodic functions	3+2+2
(b)	The incidence matrix of a directed graph is given below. Draw the directed graph $[A] = \begin{bmatrix} 0 & 1 & 0 & 1 & -1 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 & 0 & -1 & 0 & -1 \\ -1 & -1 & -1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & -1 & 0 & 0 & 1 & 1 \end{bmatrix}$	7
2.	For the network as shown below. Draw the directed graph and write down the fundamental tie set matrix for a particular tree of tour choice. Use it to determine the current *I*. 	14
3.	The input voltage to a series *RL* circuit is $e(t) = 180\sin(314t + 10°) + 56\sin(942t + 35°) + 18$ The values of *R* and *L* are 18 Ω and 0.0413 H. Determine (i) the expression for current (ii) rms values of voltage and current. (iii)	

	average power dissipation in the circuit and (iv) the power factor of the circuit.	14
4.	Discuss the even function symmetry of a periodic function with suitable example. Hence show that Fourier Series of an even periodic function contains only cosine terms plus a constant.	4 +10
5. (a)	State and explain Thevenin's Theorem with suitable example.	4
(b)	For the network as shown below, find the current through 4 ohm resistor using Thevenin's theorem. 	10
6. (a)	State and explain Superposition Theorem with suitable example.	4
(b)	For the network as shown below, Determine the voltage v using any method of your choice. 	10
7. (a)	State and explain Maximum Power Transfer Theorem with suitable example.	4
(b)	For the network shown as shown below, find the value of R which results in maximum power absorbed in it. What is the value of maximum power?	10



8. (a) Determine the current $i(t)$ in a series RLC circuit consisting of $R = 5\ Ohm$, $L = 1\ H$ and $C = 0.25\ F$ when a ramp input voltage $12r(t-2)$ is applied. 14

9. What is reciprocity and symmetry of two port network? Derive the condition for reciprocity in transmission parameter (A, B, C, D parameter) representation of a two port network. 4+10

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