Ref No. Ex/PE/PC/B/T/215/2023(S)

B. POWER ENGINEERING EXAMINATION -2023

(2^{nd} Year , 1^{st} Semester Supplementary)

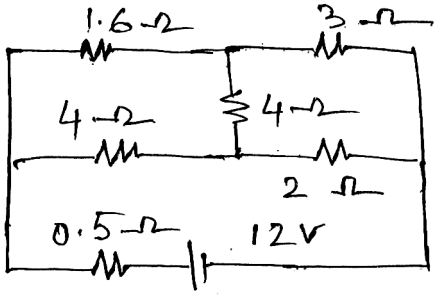
SUBJECT – Circuit Theory

Time: Three hours | Full Marks: 100

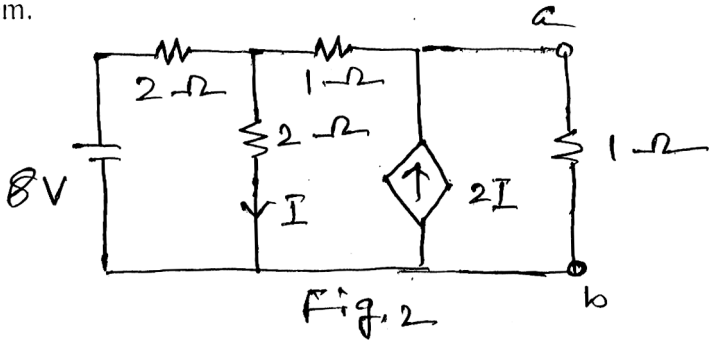
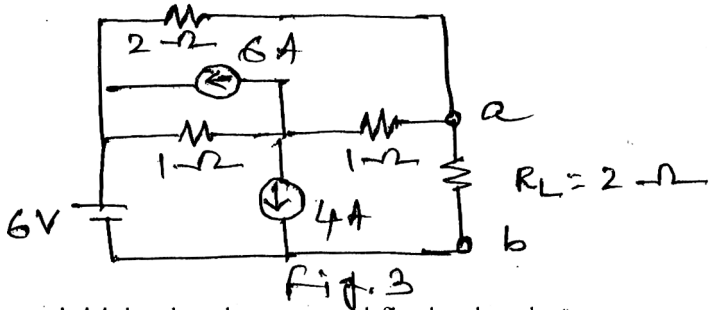
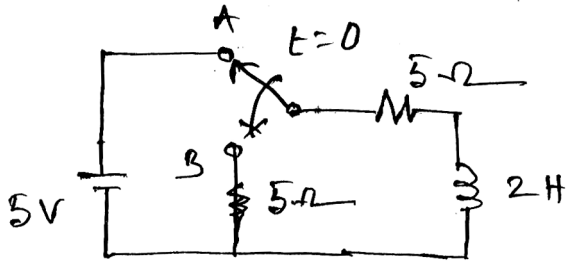
Answer any ***seven*** questions

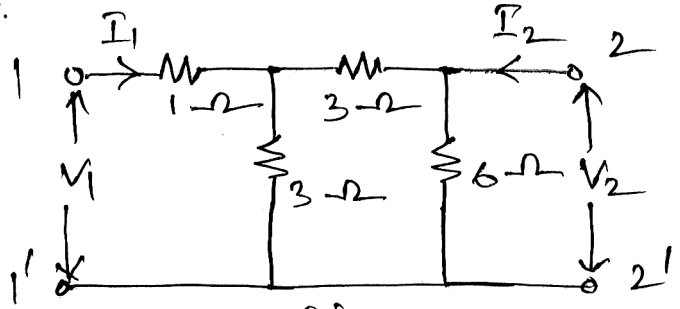
Assume suitable value for missing data, if any

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) Half wave symmetry of periodic function (ii) Cut set and fundamental cut set (iii) Fundamental Tie set matrix	2+2+2
(b)	What is incidence matrix? The incidence matrix of a directed graph is given below. Draw the directed graph. $[A] = \begin{bmatrix} 1 & -1 & 0 & 1 & 0 & 0 & 0 \\ -1 & 1 & -1 & 0 & 0 & -1 & -1 \\ 0 & 0 & 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & 1 & -1 & 1 & 0 & 1 \end{bmatrix}$	8
2.	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

[Turn over

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 prove initial value theorem and final value theorem.	7
(b)	For the network shown as fig. 4, 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.  fig. 4	7

8.	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 networks? Derive the conditions for reciprocity and symmetry in z-parameter representation of a two port network.	14
10.	Find the *y*-parameters and *h*-parameters for network as shown in fig.5 below.  fig. 5	14