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CUIT TH

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National Institute of Technology, Kurukshetra
End Semester Exams (Theory) May/June 2024

Programme: B. Tech, ECE
Subject Code: ECPC-101
Time: Three Hours

Semester: II
Subject Name: Circuit Theory
Max. Marks: 50

Instructions:

1. All the questions are compulsory. Internal choice as applicable
2. All parts of a question must be done at one place.
3. Unless stated otherwise, the symbols have their usual meanings in context with the subject
4. Assume suitable data, if required.

Q. No. 1 Attempt any four **4*2.5**

(a) State and explain substitution theorem with the help of proper circuit diagram
(b) State and explain KVL and KCL.
(c) Write down the restrictions on pole and zero locations for Driving Point Function
(d) Derive the expression for star-delta conversion.
(e) Derive the expression of Quality factor in series RLC circuit
(f) State and explain initial and final value theorem in Laplace transform

Q. No. 2 **2*5**

(a) Find the voltage V in the network shown in Fig. 1 which makes the current in the 10Ω resistor zero.

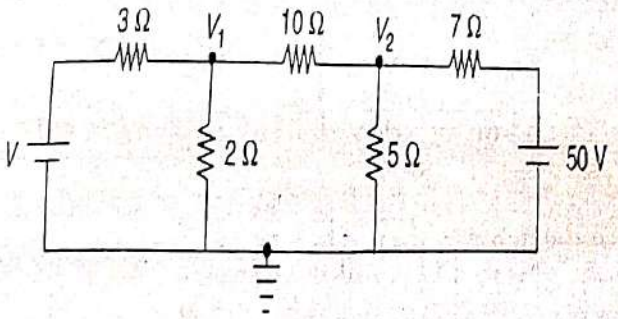

Fig. 1

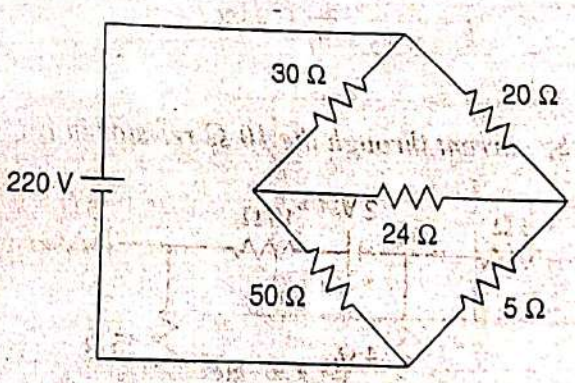

Fig. 2

(b) Determine the current through the 24Ω resistor in Fig. 2 using thevenin's theorem

Q. No. 3 **2*5**

(a) Derive the expression for the resonant frequency of the parallel circuit as shown in Fig. 3
(b) In the network shown in Fig. 4, a steady state is reached with switch open. At $t=0$, the switch is closed. Find the three loop currents at $t=0^+$.

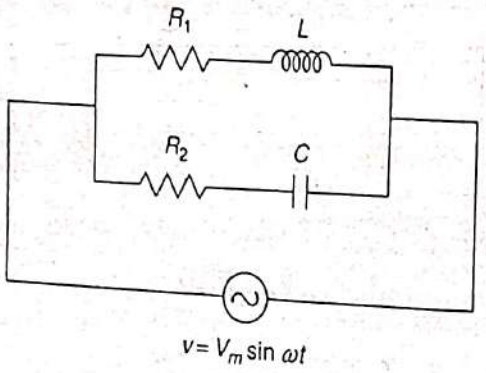

Fig. 3

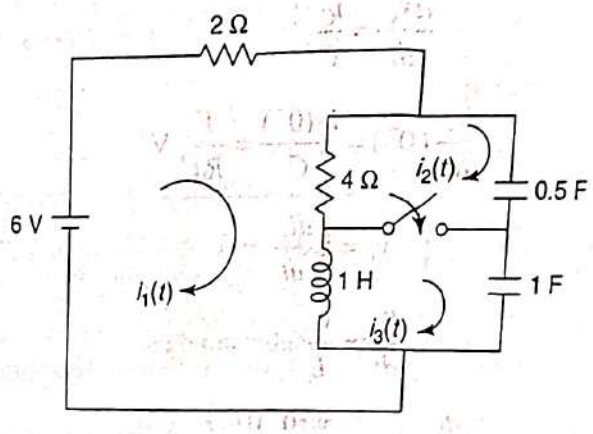

Fig. 4

Q. No. 4

(a) In the network given in Fig. 5, the switch is closed at $t=0$ with the network previously unenergised (zero initial conditions). Determine current $i_1(t)$. **2*5**

(b) Find the network function $\frac{V_2}{V_1}$ for the network shown in Fig. 6.

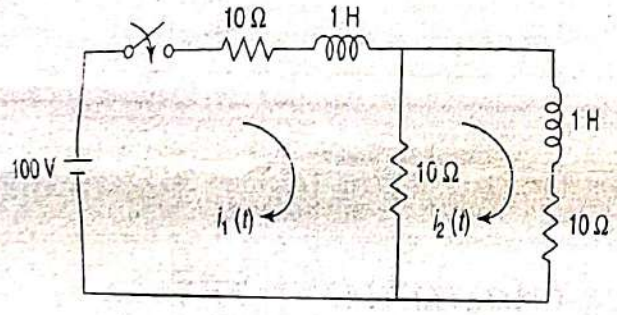

Fig. 5

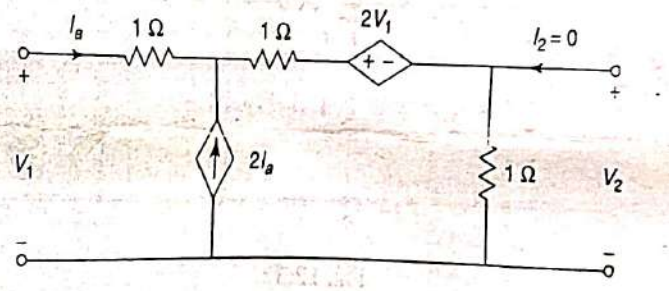

Fig. 6

Q. No. 5

(a) A network is shown in Fig. 7. The poles and zeros of the driving point function $Z(s)$ of this network are at the following places: **2*5**

Poles at $-\frac{1}{2} \pm j\frac{\sqrt{3}}{2}$ and Zero at -1. If $Z(j0)=1$, find the value of R, L and C.

(b) For the network shown in Fig. 8, find the h parameters.

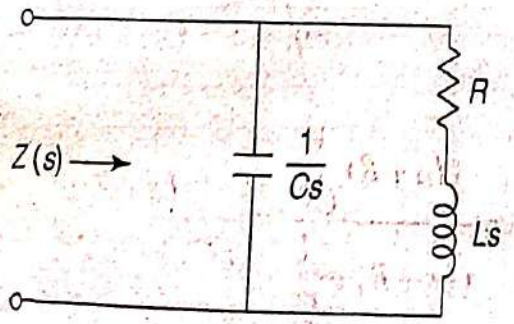

Fig. 7

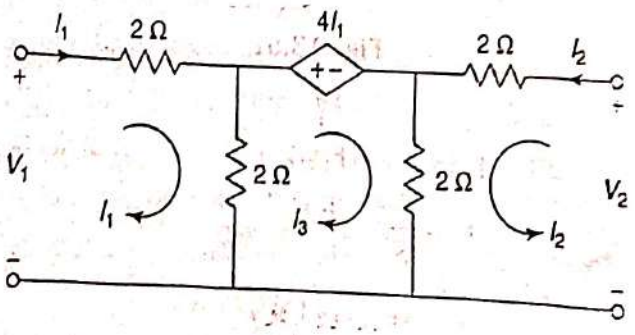

Fig. 8