Roll No.: _____

National Institute of Technology Delhi

Name of the Examination: End-Semester Examination (Autumn 2022)

Branch: ECE and EEE **Semester: 3^{rd}**

Title of the Course: Network Analysis and Synthesis **Course Code: EEL 201**

Date of Examination: 09.12.2022 **Time: 3 hours** **Maximum Marks: 50**

Note :1.This question paper has 3 sections. All the questions are compulsory.

2.All the symbols have their ususal meaning. Make suitable assumptions wherever required.

Section A

(Each question in this section carries 02 marks).

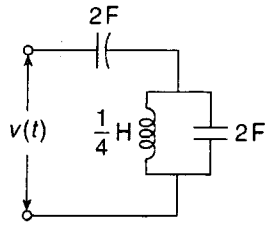
1. Write the conditions for reciprocity and symmetry in terms of hybrid parameters.

2. Two identical coupled inductors are connected in series. The inductances measured for the two possible series connections are 380 μH and 240 μH. The mutual inductance is ____ μH.

3. What is the value of resonant frequency in case of series resonance and in case of parallel resonance?

4. A series RLC circuit has $R = 10\ \Omega$, $L = 0.01$ H, and $C = 100$ mF. What is the Q-factor of the circuit at the resonance?

5. Find the driving point impedance of the network shown below.



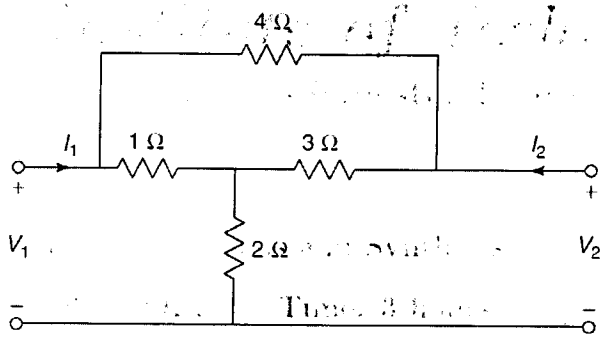
Section B

(Each question in this section carries 05 marks).

1. Obtain the Cauer I form realization of the following LC impedance function

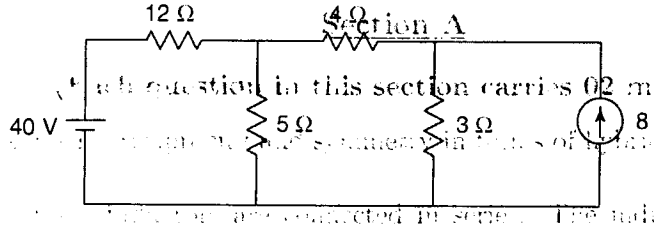
$$Z(s) = \frac{s^5 + 7s^3 + 10s}{s^4 + 5s^2 + 4}$$

2. Find the open-circuit impedance parameters for the network shown below.



3. Obtain the expressions for y-parameters in terms of $ABCD$ parameters.

4. Find the current through the 4 Ω resistor by applying superposition theorem.



Section C

(Each question in this section carries 10 marks).

1. Realize Foster forms of the following RC impedance function

$$Z(s) = \frac{2(s+2)(s+4)}{(s+1)(s+3)}$$

2. An ideal capacitor with capacitance C is charged to a voltage V_0 and at $t = 0$ it is connected across an ideal inductor with inductance L. Find the voltage across the capacitor for $t > 0$.