A. (5×8=40 points) Answer each of the following statements.

1. To explain "The total instantaneous power in a balanced three-phase system is constant."

2. To explain "If same power loss is tolerated in both system, three-phase system use only 75% of materials of a single-phase system."

3. To use the red, black, and white wires for "120-V connection" and "240-V connection" in household system.

4. Comparison between "self-inductance" and "mutual-inductance".

5. To derive $M = k\sqrt{L_1 L_2}$, where coupling coefficient $k = c_M / \sqrt{c_1 c_2}$.

6. Comparison between "linear transform" and "ideal transformer".

7. Describe the function of the isolation transformer in Fig. 1. Why?

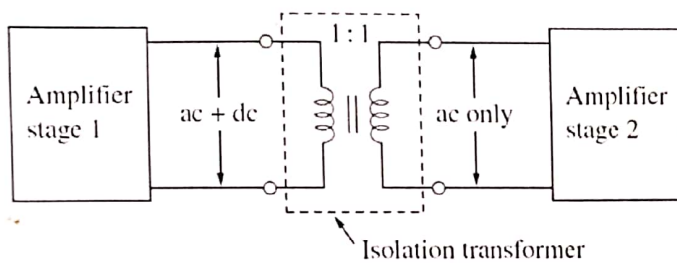8. Describe the function of the isolation transformer & the rectifier in Fig. 2.
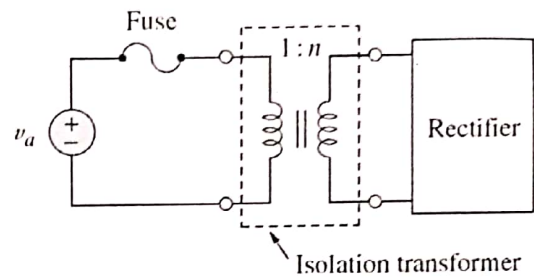

Fig. 1

Fig. 2

B. (8+6=14 points) Balanced Wye-Delta Connection + Power in a Balanced System: In Fig. 3, one line voltage of a balanced Y-connected source is $V_{AB} = 120\angle -20°$ V. Assume the *abc* sequence. If the source is connected to a Δ-connected load of $20\angle 40°\,\Omega$,

1. Find the phase and line currents.

2. Find the average power delivered to the load.

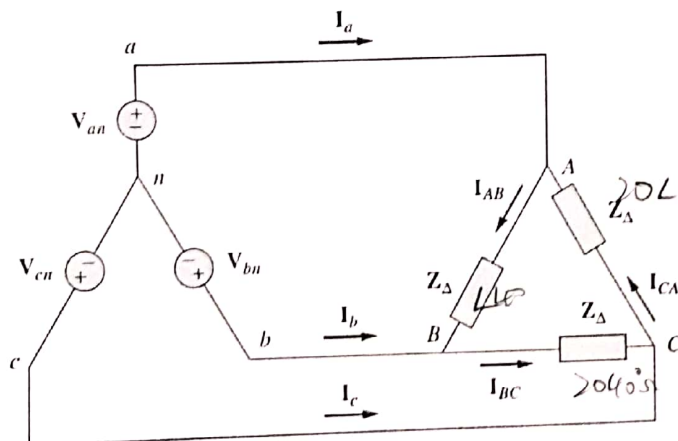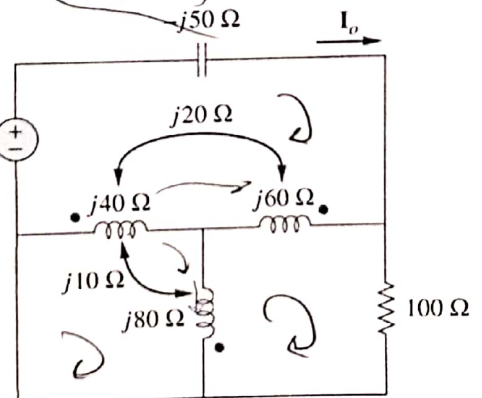**C. (15 points) Mutual Inductance:** Find current I_o in Fig. 4.

Fig. 3

Fig. 4

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