

# International Islamic University Chittagong

Department of Electrical and Electronic Engineering

B. Sc. Engineering in EEE

Final Examination, Spring 2022

Course Code: **EEE 1201**

Course Title: **Electrical Circuits II**

Time: 2 hours 30 minutes

Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

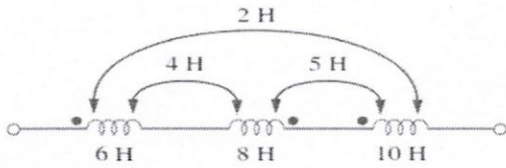
(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

Course Outcomes (COs) of the Questions	
CLO1	Reflect a basic understanding of alternating current waveforms, phase shifting, impedance, power factor, impedance and phasor diagram, circuit theorems for solving series-parallel circuits, poly phase system, magnetic coupling, resonance, and two port network.
CLO2	Apply complex variable, various circuit rules and theorems for solving complex series parallel networks.
CLO3	Design various series-parallel resonant circuits, passive filters, and two port networks.

Bloom's Levels of the Questions						
Letter Symbols	R	U	App	An	E	C
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

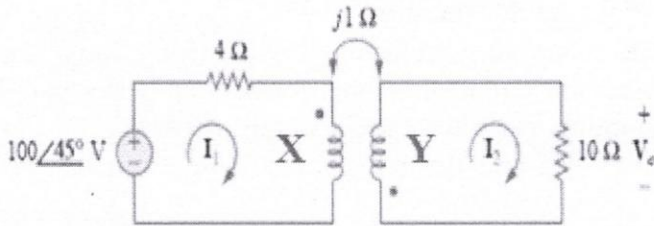
Q. No.	Part A [Answer the questions from the followings]	COs	BL	M
1. a)	Why the maximum voltage across the capacitor lies before the resonance condition? Give proper explanation in in this regard. Show the plot of $V_R$ , $V_L$ , $V_C$ , $I$ , $X_L$ and $X_C$ in terms of capacitance variation for a series RLC resonance circuit.	CO3	E	5
1. b)	Design a bandpass filter having $R$ , $L$ and $C$ in series connection with a lower cutoff frequency of 20.1 KHz and an upper cutoff frequency of 20.30 KHz. Consider a suitable value of $R$ in the range of 10 to 20 K $\Omega$ . Calculate $L$ , $C$ , and $Q$ . Show the response curve for the filter.	CO3	C	5
Or,				
1. a)	What are the conditions for series resonance? Show necessary figures to explain the resonance conditions.	CO3	E	5
1. b)	Design a band reject filter having $R$ , $L$ and $C$ in series connection with a lower cutoff frequency of 20.1 KHz and an upper cutoff frequency of 20.30 KHz. Consider a suitable value of $R$ in the range of 10 to 20 K $\Omega$ . Calculate $L$ , $C$ , and $Q$ . Show the response curve for the filter.	CO3	C	5

2. a) For the three coupled coils in the following figure (**Fig. 1**), determine the total inductance considering the mutual inductance and the dot conventions. CO1 Ap 5



**Fig. 1.** Series inductors for finding equivalent inductance for Q. 2. a).

2. b) What is mutual inductance? Calculate the voltage  $V_o$  in the circuit shown in **Fig. 2**. (X and Y are last two digits of your ID) CO1 Ap 5

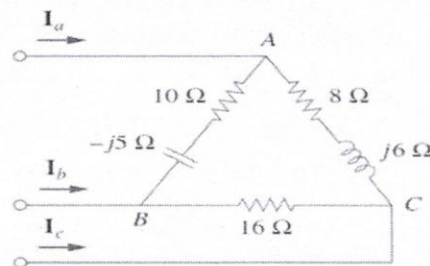


**Fig. 2** Circuit diagram for the question of 2. b)

### PART B

[Answer the questions from the followings]

3. a) Discuss the process to find the magnitude of the line current of a  $\Delta$  connected generator is  $\sqrt{3}$  times the phase current. Explain why it is  $\sqrt{3}$  times. CO1 Ap 5
3. b) Show that the instantaneous power for a three phase system under steady state condition is independent of time whereas the single phase power has a double-frequency variation with respect to time. Also illustrate the comparison graphically. CO1 U 5
4. a) A line voltage of a balance Y-connected source is  $V_{AB}=240 \angle 20^\circ$ . If the source is connected to a balanced  $\Delta$ -connected load and considering each of the load to be  $20 \angle 40^\circ \Omega$ , determine the phase and line currents of the system. Assume positive phase sequence. CO1 Ap 5
4. b) The unbalanced  $\Delta$ -load of **Fig. 3** is supplied by a balanced line to line voltage of 240 V in the positive sequence. Determine the line currents. Take  $V_{ab}$  as reference. CO1 Ap 5



**Fig. 3.** Part of the network for Questio no 4. b)



Or,

- 4 a) A positive-sequence, balance  $\Delta$ -connected source supplies a balance  $\Delta$ -connected load. If the impedance per phase of the load is  $18+j12 \Omega$  and  $I_a=19.202 \angle 35^\circ$  A, determine the phase current  $I_{AB}$  and phase voltage  $V_{AB}$ . CO1 Ap 5
- 4 b) A unbalance  $\Delta$ - load is connected with a balance Y-connected supply. Where the line voltages are indicated in the figure (Fig. 4). Considering a positive sequence and the voltage  $V_{AB}$  as reference, determine the phase current and line currents for the load. Sketch the phasor diagram for the currents. CO1 Ap 5

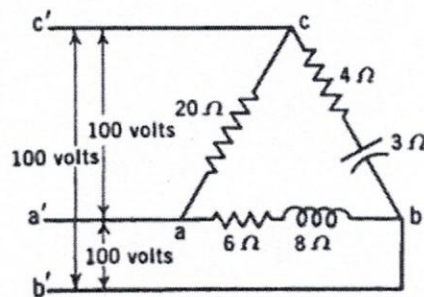


Fig. 4. Part of the network for Question no 4. b)

5. a) What is the significance of two port network? What are the essential information we can get from this analysis? CO3 U 5
5. b) Determine the current  $I_1$  and  $I_2$  for the following network indicated in Fig. 5. CO3 E 5

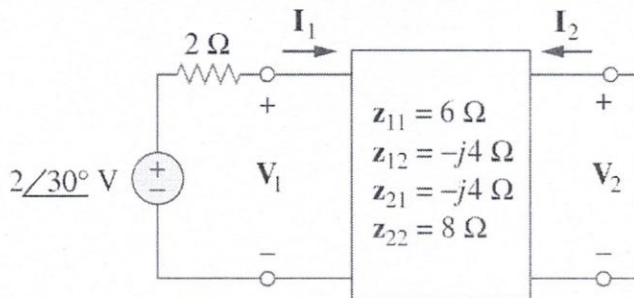


Fig. 5. Part of the network for Question no 5. b)