



B.E/B.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Second Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U18EEI2201: Electric Circuit Analysis

COURSE OUTCOMES

- CO1:** Reduce the complex circuits using reduction techniques and source transformations.
CO2: Analyse and measure the response of AC circuits.
CO3: Apply network theorem to compute the electrical parameters of circuit and demonstrate in hardware.
CO4: Familiarize with the concepts of magnetic circuits and analyse its parameters.
CO5: Understand the 3 phase circuit concepts with balanced and unbalanced loads.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

- | | | |
|--|-----|-------------------|
| 1. Recall the network elements classification with example. | CO1 | [K ₃] |
| 2. Two lamps each of 230V and 60W rating are connected in series across a single phase 230V supply. Determine the total power consumed by the two lamps. | CO1 | [K ₃] |
| 3. Write the expression for the instantaneous values of emfs in a 3 phase circuit. | CO2 | [K ₂] |
| 4. Derive the expression for resonant frequency. | CO2 | [K ₂] |
| 5. Recall the conditions for maximum power transfer in DC and AC circuits. | CO3 | [K ₃] |
| 6. Define reciprocity theorem. | CO3 | [K ₃] |
| 7. Recall DOT rule for a magnetically coupled circuit. | CO4 | [K ₂] |
| 8. Outline the B-H curve and summarize the hysteresis loop. | CO4 | [K ₂] |
| 9. The input power to a 3-phase a.c. motor is measured as 5kW. If the voltage and current to the motor are 400V and 8.6A respectively, determine the power factor of the system. | CO5 | [K ₂] |
| 10. In two wattmeter method of power measurement of a 3-phase balanced system, calculate the power factor of the system if both watt meters show the same positive reading. | CO5 | [K ₂] |

Answer any FIVE Questions:-
(Answer not more than 400 words)
PART B (5 x 16 = 80 Marks)

11. a) Estimate V_{CE} and V_{AG} for the circuit shown in Fig.1. 8 CO1 [K₃]

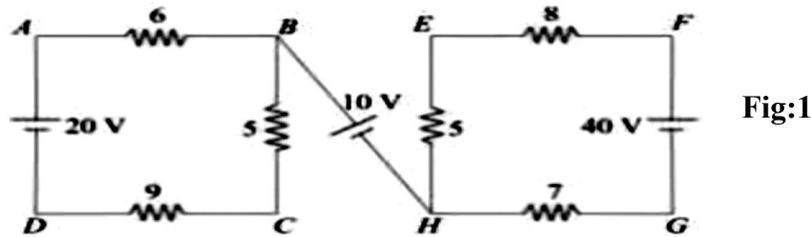


Fig:1

- b) Build the expression for Delta (Δ) - Star(Y) transformation. 8 CO1 [K₃]
12. a) A sinusoidal varying alternating current of frequency 60 Hz has a maximum value of 15 amperes. 8 CO2 [K₂]
1. Write down the equation for instantaneous value,
 2. Find the value of current after $1/200$ second,
 3. Find the time taken to reach 10 amperes for the first time, and
 4. Find its average value.
- b) A solenoid coil with a resistance of 30 ohms and an inductance of 200mH is connected to a 230VAC, 50Hz supply. Calculate 8 CO2 [K₂]
- (a) the solenoids impedance,
 - (b) the current consumed by the solenoid,
 - (c) the phase angle between the current and the applied voltage, and
 - (d) the average power consumed by the solenoid.
13. a) Write down the node voltage equation and determine the voltages V_1 , V_2 and currents $I_{10\Omega}$ and $I_{5\Omega}$ for the circuit in Fig.2. 8 CO3 [K₃]

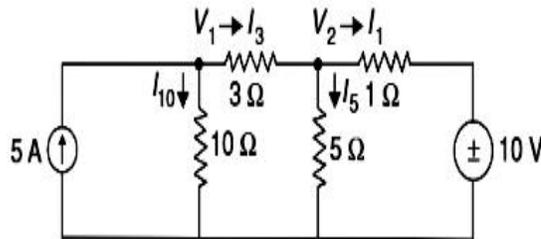


Fig:2

- b) Calculate the resonant frequency, the current at resonance, the voltage across the inductor and capacitor at resonance, the quality factor and the bandwidth of the circuit shown in fig.3. 8 CO3 [K₃]

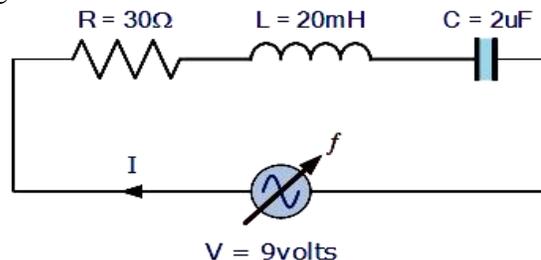
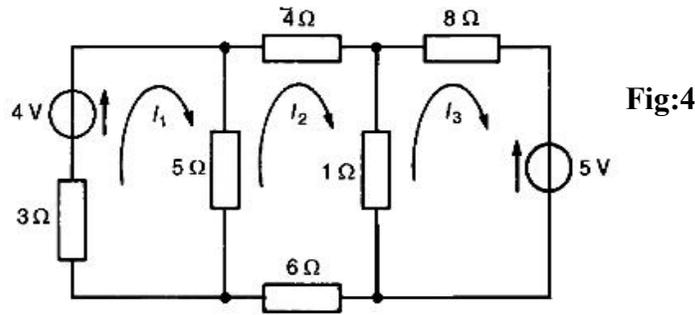
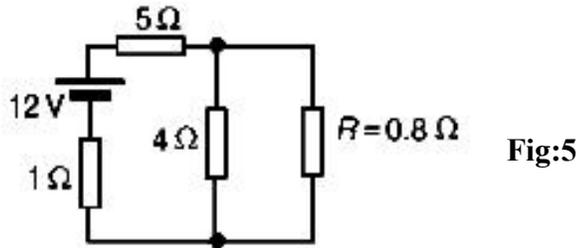


Fig:3

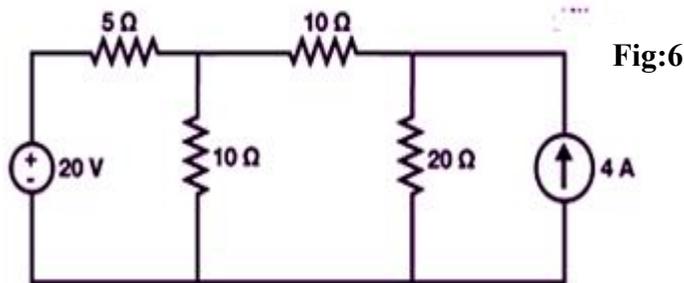
14. a) Use mesh-current analysis to determine the current flowing in 5Ω and 1Ω resistances of the d.c. circuit shown in the Fig.4. 8 CO3 [K3]



- b) For the network shown in fig.5 determine the current in the 0.8Ω resistor using Thévenin's theorem. 8 CO3 [K3]

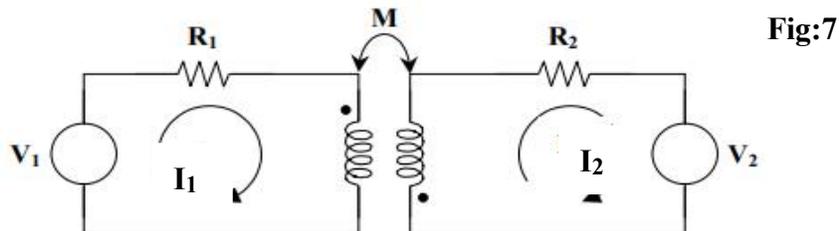


15. a) Find the current flowing through 20Ω using the superposition theorem for the circuit shown in fig.6. 8 CO3 [K3]



- b) Determine the coupling co-efficient k and currents in primary and secondary circuits with the following data for the fig.7. 8 CO4 [K2]

$V_1 = V_2 = 10$ Volts, $R_1 = R_2 = 10$ Ohms and $\omega L_1 = \omega L_2 = 10$ Ohms.



16. a) A 415V, 3-phase a.c. motor has a power output of 12.75kW and operates at a power factor of 0.77 lagging and with an efficiency of 85 per cent. If the motor is delta-connected, determine
- (a) the power input,
 - (b) the line current and
 - (c) the phase current.
- b) Explain the two wattmeter method with the circuit for power measurement of a 3-phase balanced circuit and derive the total real power expression.
