A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U2305

B.E./B.Tech. DEGREE EXAMINATION, MAY 2024

Second Semester

Electrical and Electronics Engineering

21UEE205- ELECTRIC CIRCUIT ANALYSIS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. According to Kirchoff's voltage law, CO1- U

   (a) The algebraic sum of all the e.m.f's in the circuit is zero

   (b) Algebraic sum all the voltage drops in the circuit is zero

   (c) Algebraic sum of e.m.f's plus algebraic sum of voltage drops is equal to zero

   (d) All of these

2. Which among the following is true about ohm's law? CO1- U

   (a) $I \propto V$ (b) $I = V/R$ (c) $V = IR$ (d) All of the above

3. The form factor of sinusoidal wave form is ____ CO1- U

   (a) 1.414 (b) 1.11 (c) 0 (d) 1.5

4. In a three-phase system, the voltages are separated by _____ CO1- U

   (a)45° (b) 90° (c) 120° (d) 180°

5. When the power transferred to the load is maximum, the efficiency of power transfer is CO1- U

   (a) 25%. (b)100%. (c) 75%. (d) 50%

6. In maximum power transfer theorem, internal resistance must be CO1-U

   (a) Greater the internal resistance (b) equal to zero

   (c) Equal to load resistance (d) equal to internal resistance

7. The power factor is unity for the _____ resonant circuit. CO1- U

(a) Series (b) parallel (c) both (a) & (b) (d) none of the above

8. In a series resonance circuit, series resonance occurs when? CO1-U

(a) $X_L = 1$ (b) $X_C = 1$ (c) $X_L = X_C$ (d) $X_L = - X_C$

9. The time constant of an R-C circuit is? CO1- U

(a) RC (b) R/C (c) R (d) C

10. If the roots of an equation are real and equal, then the response will be? CO1-U

(a) over damped (b) damped (c) critically damped (d) under damped

PART – B (5 x 2= 10 Marks)

11. In a circuit three resistors R_(1) Ω ,R_(2) Ω and R_(3) Ω are connected in series. What is the total resistance CO1-U

12. Define RMS value CO1-U

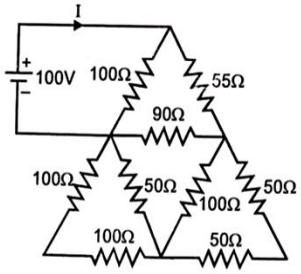
13. Write the condition of transfer maximum power from source to load in circuit CO1-U

14. Determine the resonant frequency of the RLC series circuit with R=10Ω, L=0.5 mH and C = 10μF CO1-U

15. Define transient response. CO1-U

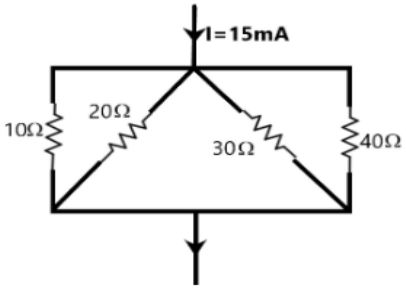
PART – C (5 x 16= 80Marks)

16. (a) Briefly explain about the connections of resistance in the circuit Solve the total current taken from the source. CO2-App (16)



Or

(b) Using the current division rule, find the current in each branch of the circuit shown in the figure. CO2 -App (16)

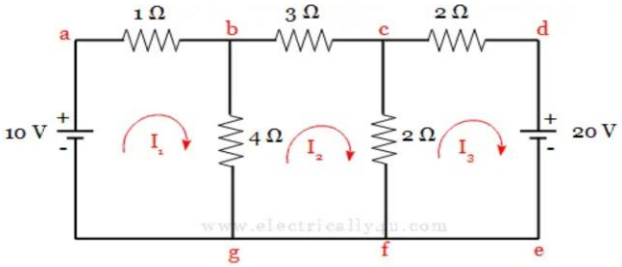


17. (a) A resistor of 6 Ω and an inductor of 25.5mH are connected in series across 220V, 50Hz supply. Find (1) Inductive reactance (2) Impedance (3) Current (4) Phase angle (5) Power factor (6) Power (7) Voltage across the resistor and(8) Voltage across inductor — CO2- App — (16)

Or

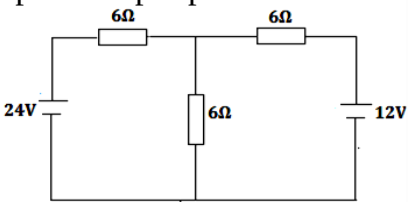
(b) With a neat circuit and phasor diagram explain the three phase power measurement by two wattmeter method. — CO2- App — (16)

18. (a) Find the current through 4 Ω load resistor using mesh current analysis — CO2- App — (16)



Or

(b) Find the current through load resistor (6 Ω) in the following circuit by the principle of super position theorem — CO2- App — (16)



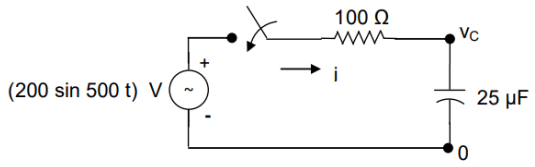
19. (a) Consider a series RLC circuit consisting of a resistor (R = 10 Ω), an inductor (L = 0.5 H), and a capacitor (C = 50 μF). The circuit is excited by a sinusoidal voltage source with a frequency of 1 kHz. Analyze the circuit using the concept of resonance and answer the following questions: — CO4- Ana — (16)

(a) Calculate the resonant frequency of the circuit.
(b) Determine the impedance at resonance and calculate its value.
(c) Calculate the quality factor (Q-factor) of the circuit.
(d) Determine the bandwidth of the circuit.

Or

(b) Consider an RLC circuit consisting of a resistor (R), inductor (L), and capacitor (C) connected in series. The values of R, L, and C are given as follows: R = 100 Ω, L = 0.5 H, and C = 10 μF. Answer the following questions based on this circuit:
(a) Calculate the resonant frequency (fr) of the circuit.
(b) Determine the Q-factor (Quality factor) of the circuit.
(c) Calculate the bandwidth of the circuit. CO4-Ana (16)

20. (a) For the circuit shown below, find the transient current, assuming that the initial charge on the capacitor as zero, when the switch is closed at time t = 0. CO4-Ana (16)



Or

(b) Initially relaxed series RL circuit with R = 100 Ω and L = 20 H has dc voltage of 200 V applied at time t = 0. Find (a) the equation for current and voltages across different elements (b) the current at time t = 0.5 s and 1.0 s (c) the time at which the voltages across the resistor and inductor are equal. CO4-Ana (16)