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

Question Paper Code: R2305

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

Second Semester

Electrical and Electronics Engineering

R21UEE205- ELECTRIC CIRCUIT ANALYSIS

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer All Questions

PART A - (10 x 1 = 10 Marks)

1. 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 these

2. Two bulbs B1 100 W, 200 V and B2 40 W, 200 V are connected in series across 200 V battery, the total circuit resistance will be CO1- U

   (a)1000 Ω (b) 400 Ω (c)1400 Ω (d)135 Ω

3. An alternating voltage is given by $V = V_m \sin 157t$.The frequency of the alternating voltage is _____ CO1-U

   (a) 50Hz (b) 25Hz (c) 100Hz (d) 75Hz

4. The power factor of an AC circuit is equal to CO1-U

   (a) Cosine of the phase angle (b) Sine of the phase angle

   (c) Unity for a resistive circuit (d)Unity for a reactive circuit

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. For high efficiency of transfer of power, internal resistance of the source should be CO1-U

   (a) equal to the load resistance (b) less than the load resistance

   (c) more than the load resistance (d) none of the above

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

(a) Series (b) parallel (c) both a &b (d) none

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

(a) Series (b) parallel (c) both a &b (d) none

9. If the resistance in parallel with a parallel resonant circuit is reduced, the bandwidth CO1-U

(a) Disappears (b) Becomes sharper

(c) Increases (d) Decreases

10. If the roots of an equation are complex conjugate, then the response will be? CO1-U

(a) over damped (b) critically damped (c) 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 form factor CO1 U

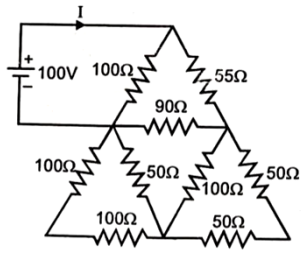
13. Draw the Norton's equivalent circuit CO1 U

14. Compare series and parallel reasonance CO1 U

15. What is damping ratio?. CO1 U

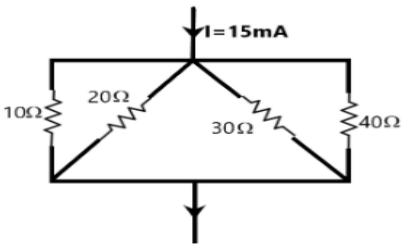
PART – C (5 x 16= 80 Marks)

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)

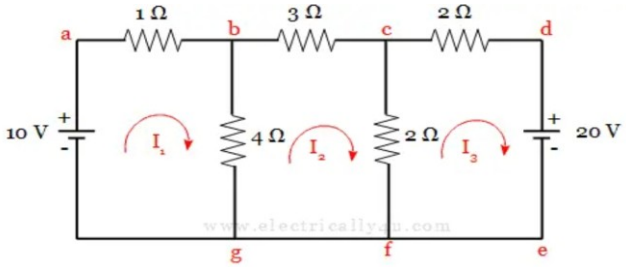


17. (a) A resistor of 6 Ω and an inductor of 25.5mH are connected in series across 220V, 50Hz supply. Find (1) Inductive reactance (2) Impedance (3) Current (4) Phase angle (5) Power factor (6) Power (7) Voltage across the resistor and(8) Voltage across inductor — CO2- Ana — (16)

Or

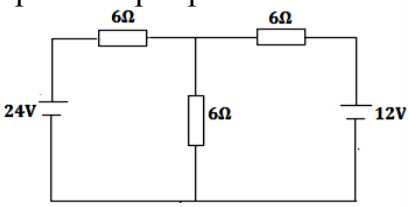
(b) With a neat circuit and phasor diagram explain the three phase power measurement by two wattmeter method. — CO2- App — (16)

18. (a) Find the current through 10 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 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 = 5 Ω, L = 40mH, and C = 1μF. Answer the following questions based on this circuit: — CO4-Ana — (16)

(a) Calculate the resonant frequency (fr) of the circuit.

(b) Determine the Q-factor (Quality factor) of the circuit.

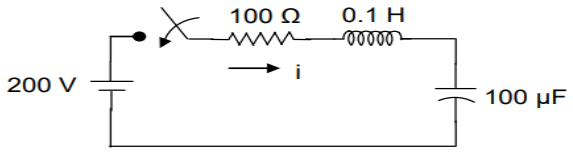
(c) Calculate the bandwidth of the circuit.

(d) Half Power frequencies.

Or

(b) Consider a series RLC circuit consisting of a resistor (R = 10 Ω), an inductor (L = 30 mH), and a capacitor (C = 1 μF), and is supplied from a 10V variable frequency source. Analyze the circuit using the concept of resonance and answer the following questions:
Find the frequency for which the voltage developed across the capacitor is a maximum and calculate the magnitude of this voltage. CO4-Ana (16)

20. (a) For the RLC circuit shown, find the expression for the transient current
When the switch is closed at time t = 0. Assume initially relaxed circuit conditions CO4-Ana (16)



Or

(b) Consider a series RC circuit consisting of a resistor (R = 1 kΩ) and a capacitor (C = 1 μF). The circuit is initially at rest, and a voltage step of 10 V is applied at t = 0. Analyze the circuit's transient response and answer the following questions: CO4-Ana (16)

(a) Calculate the time constant (τ) of the circuit.
(b) Determine the natural response of the circuit and explain its behavior over time.
(c) Calculate the initial capacitor voltage (Vc(0)) in the circuit when the voltage step is applied.
(d) Determine the complete solution for the capacitor voltage (Vc(t)) in the circuit as a function of time.