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**Question Paper Code: U2305**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

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. Three 2 ohm resistors are connected to form triangle. The effective resistance between any two corners is \_\_\_\_ ohm CO1- U
  - (a) 6  $\Omega$
  - (b) 2  $\Omega$
  - (c) (3/4)  $\Omega$
  - (d) (4/3)  $\Omega$
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

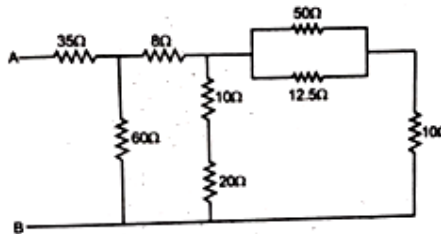
7. The power factor is unity for the \_\_\_\_\_ resonant circuit. CO1- U  
 (a) Series (b) parallel (c) both (a) & (b) (d) none of the above
8. In a series resonance circuit, series resonance occurs when? CO1-U  
 (a)  $X_L = 1$  (b)  $X_C = 1$  (c)  $X_L = X_C$  (d)  $X_L = - X_C$
9. The time constant 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. State Kirchoff's current law CO1-U
12. What is power factor CO1-U
13. State maximum power transfer theorems CO1-U
14. Define resonant frequency CO1-U
15. What is damping ratio? CO1-U

PART – C (5 x 16= 80Marks)

16. (a) In the circuit shown below, solve the total resistance and the current through each branch. CO2-App (16)



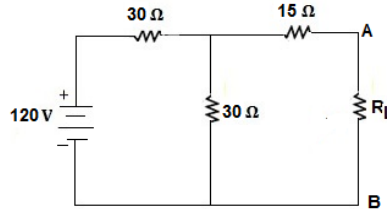
Or

- (b) Derive an expression for STAR connected resistance into delta connected resistance. CO2 -App (16)
17. (a) A resistor of  $6\ \Omega$  and an inductor of  $25.5\text{mH}$  are connected in series across  $220\text{V}$ ,  $50\text{Hz}$  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

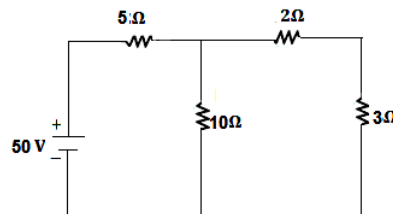
- (b) With a neat circuit and phasor diagram explain the three phase power measurement by two wattmeter method. CO2- App (16)

18. (a) For the circuit given below calculate the value of the load resistance for maximum power transferred from source to load. Also find the value of maximum power in  $R_L$ . CO2- App (16)



Or

- (b) By using Thevenin's theorems to find out current in  $3\Omega$  resistors is CO2- App (16)



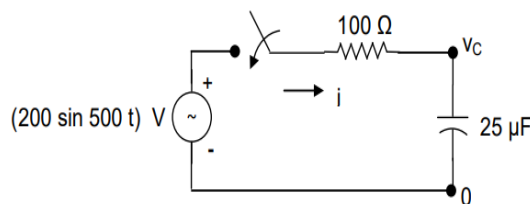
19. (a) (i) A series RLC circuit has  $R = 5\Omega$ ,  $L = 40\text{mH}$  and  $C = 1\mu\text{F}$ . Calculate resonant frequency, Quality factor of the circuit, half power frequency  $f_1$  and  $f_2$  and separation between half power frequencies. CO4- Ana (8)

- (ii) Derive an expression for resonance frequency of series resonance circuit CO4- Ana (8)

Or

- (b) (i) Explain the single tuned and double tuned circuits. (8) CO4- Ana (16)  
(ii) Derive the formula for mutual inductance in terms of coefficient of coupling and self-inductance. (8)

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  $R = 100 \Omega$  and  $L = 20 \text{ H}$  CO4-Ana (16)  
has dc voltage of  $200 \text{ V}$  applied at time  $t = 0$ . Find (a) the equation for current and voltages across different elements (b) the current at time  $t = 0.5 \text{ s}$  and  $1.0 \text{ s}$  (c) the time at which the voltages across the resistor and inductor are equal.