A   Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Code: R2305

B.E./B.Tech. DEGREE EXAMINATION, APRIL 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. The resistors values in delta network that is equivalent to a star   CO1-U
   containing three 120 Ω resistors is _____

   (a) 360Ω each   (b) 240Ω each   (c) 180Ω each   (d) 120Ω each

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

   (a) I ∝ V   (b) I = V/R   (c) V = IR   (d) All of these

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

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

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   CO1-U
   power transfer is

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

6. Superposition theorem can be applied only to circuits having   CO1-U

   (a) Resistive elements   (b) Passive elements

   (c) Nonlinear elements   (d) linear bilateral elements

7. 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) $X_L = -X_C$

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

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

9. In an R-C circuit, when the switch is closed, the response   CO1-U

(a) do not vary with time   (b) decays with time

(c) rises with time   (d) first increases and then 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. State Kirchhoff's current law   CO1 U

12. Define RMS value   CO1 U

13. State maximum power transfer theorems   CO1 U

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

15. What is the time constant of RL circuit with R=10Ω and L=20mH.   CO1 U

### PART – C (5 x 16= 80 Marks)

16. (a) Solve the current through 3 Ω resistor in the circuit shown in below fig: CO2-App   (16)
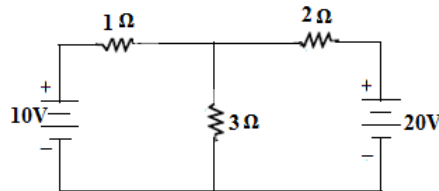

Or

(b) Derive an expression for start connected resistance into delta connected resistance.   CO2-App   (16)

17. (a) Derive an expression for power and power factor of an RC series circuit.   CO2- Ana   (16)

Or

(b) Two impedance $Z_1 = (6 + j8)\,\Omega$ and $Z_2 = (3 - j4)\,\Omega$ are connected in parallel. This combination is connected across 230V, 50HZ AC supply. Calculate the current in each branch, total current and total power consumed by the circuit   CO2- App   (16)

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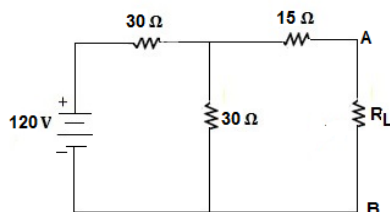
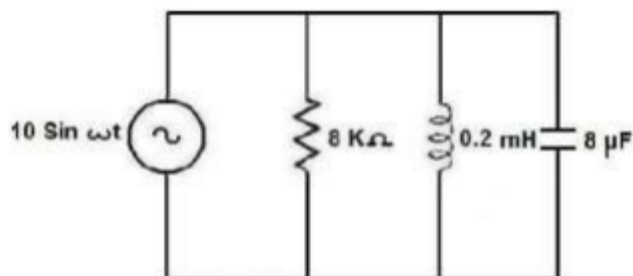Or

(b) By using Thevenin's theorems to find out current in   CO2- App   (16)
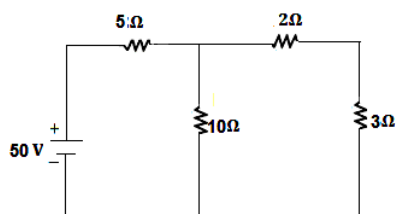
19. (a) In the parallel RLC circuit, calculate resonant frequency,   CO4-Ana   (16)
bandwidth Q-factor and power dissipated at half power
frequencies.

Or

(b) Consider an RLC circuit consisting of a resistor (R), inductor (L),   CO4-Ana   (16)
and capacitor (C) connected in series. The values of R, L, and C
are given as follows: R = 5 Ω, L = 40 mH, and C = 1 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.
(d) Half Power frequencies.

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20. (a) Consider an RL circuit with a resistor (R) of 10 Ω and an inductor   CO4-Ana (16)
(L) of 0.5 H. The circuit is initially at rest. At t = 0, a DC voltage
source of 12 V is suddenly connected across the circuit. Using
Laplace transforms, determine the expression for the current in
the circuit and plot its transient response.

Or

(b) Consider an RLC circuit consisting of a resistor (R) of 20 Ω, an   CO4-Ana (16)
inductor (L) of 1 H, and a capacitor (C) of 10 μF. The circuit is
initially at rest. At t = 0, a sinusoidal voltage source of 50 V, with
a frequency of 1 kHz, is applied across the circuit. Using Laplace
transforms, determine the expression for the current in the circuit
and plot its transient response.

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