C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 53403

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Third Semester

Electronics and Communication Engineering

15UEC303 - CIRCUIT THEORY

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The number of branches in a tree is _____ the number of branches in a graph. CO1- R

   (a) less than (b) more than (c) equal to (d) twice

2. Three equal resistances of 3Ω are connected in star. What is the resistance in one of the arms in an equivalent delta circuit? CO2- U

   (a) 10 Ω (b) 3 Ω (c) 9 Ω (d) 27 Ω

3. In a series *RLC* circuit that is operating above the resonant frequency, the current CO3-U

   (a) Lags the applied voltage (b) leads the applied voltage

   (c) is in phase with the applied voltage (d) is zero

4. When a series RC circuit is connected to a constant voltage at t = 0, the current passing through the circuit at $t = 0^+$ is _____. CO4-R

   (a) infinite (b) zero (c) V/R (d) V/ωC

5. Two coils connected in series have an equivalent inductance of 3H when connected in aiding. If the self- inductance of the first coil is 1 H, what is the self inductance of the second coil? (Assume M = 0.5 H) CO5-R

   (a) 1 H (b) 2 H (c) 3 H (d) 4 H

PART – B (5 x 3= 15Marks)

6. State Kirchoff's circuital laws. CO1- R

7. State Tellegen's theorem CO2- R

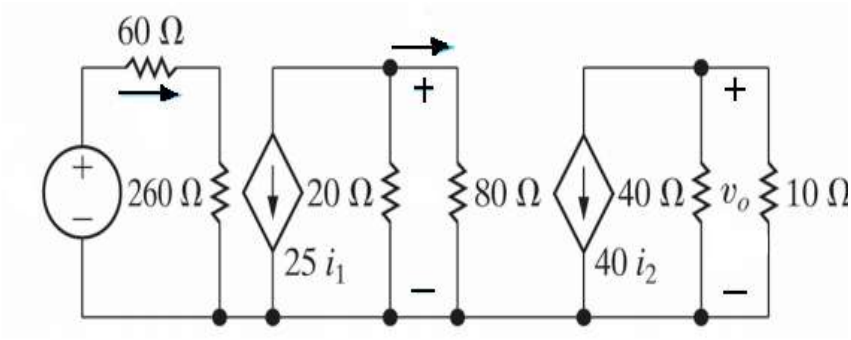
8. Draw the pole zero diagram for the given network function, $Z(s) = \frac{4(s+2)s}{(s+1)(s+3)}$. CO3- U

9. Define Z_{22} and Z_{21}. CO4- App

10. Three identical loads are connected in delta to a three-phase supply of $440\angle 0^\circ$ V. If the phase current I_R is $15\angle 0^\circ$ A, calculate the three line currents. CO5- R

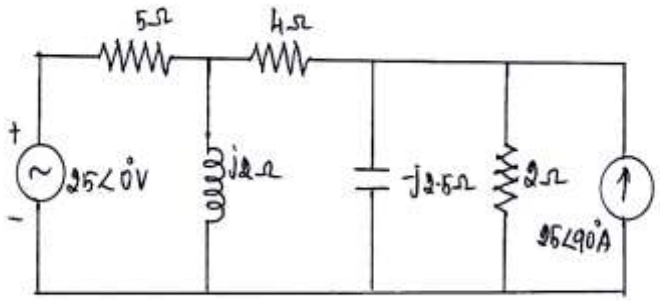
PART – C (5 x 16= 80 Marks)

11. (a) Find v_0 if input voltage Vg=32 V using Supermesh analysis for the circuit given in Figure 5. CO1-App (16)

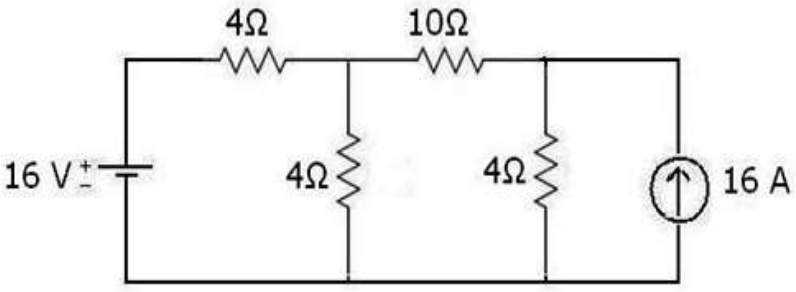


Or

(b) Using nodal analysis, find the current through the 4 ohm resistor in the circuit shown in figure. CO1-App (16)

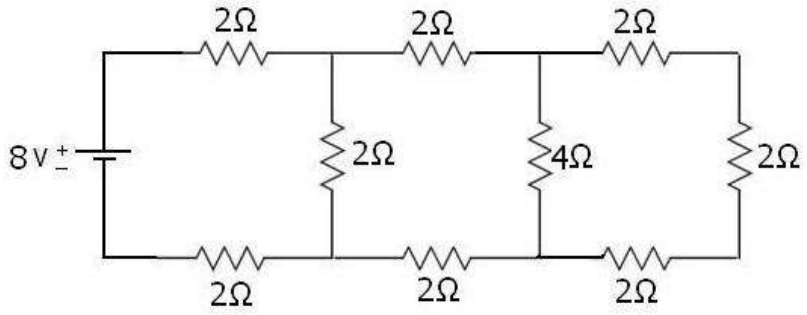


12. (a) Find the current through 10 Ω resistance in the network shown in Figure by using superposition theorem? CO2- App (16)



Or

(b) Find-out the value of current in 4Ω resistance for the network in Figure by using Norton's Theorem? CO2- App (16)



Figure

13. (a) A series RLC circuit consists of a resistance of 1KΩ and an inductance of 100mH in series with capacitance of 10pF. If 100V is applied as input, determine CO3- U (16)

- The resonant frequency
- Maximum current in the circuit
- Q factor of the circuit

The half power frequencies

Or

(b) (i) A series RLC network should resonate at 1MHz. Determine R,L and C if bandwidth is 5KHz and impedance is 50Ω at resonance. CO3- U (10)

(ii) A current source is applied to a parallel combination of R,L and C,where R=10Ω,L=1H and C=1μf. CO3- App (6)

(a) Compute the resonant frequency.

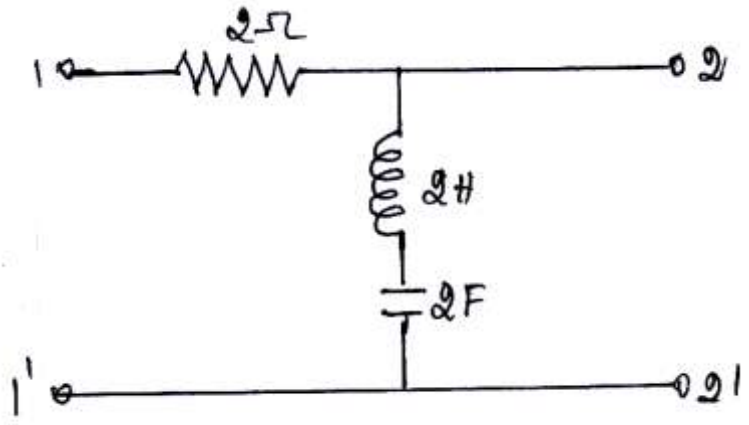
(b) Find the quality factor.

(c) Calculate the value of the bandwidth.

14. (a) A series circuit consists of R-C in series with switch and supply voltage E. The capacitor has initial charge E0. Find the transient voltage VC (t) when the switch is closed at t=0. CO4- E (16)

Or

(b) Determine the admittance parameters of the two port network shown. CO4-App (16)



15. (a) Derive the expression for the resonant condition in single tuned and double tuned circuits. CO5- U (16)

Or

(b) (i) A three phase balanced delta connected load of (4.3+j7) Ω is connected across a 400V, 3- phase balanced supply. Determine the phase currents and line currents. Assume RYB sequence. Calculate the complex power drawn by the load. CO5- App (10)

(ii) Three line voltages of a 3-phase unbalanced source are Vab=40V, Vbc=-j40 V and Vca=-40+j40 V .the source is connected to star connected impedance. Za= (3+j4) Ω, Zb= (8+j6) Ω and Zc= (5+0j) Ω. Determine the currents Ia, Ib ,Ic CO5- App (6)