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**Question Paper Code: U3403**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024  
Third Semester

Electronics and Communication Engineering

21UEC303 – Circuit Theory

(Regulation 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The network has 7 nodes and 5 independent loops, the number of branches in the network is CO1- U  
(a) 13                      (b) 12                      (c) 11                      (d) 10
2. Which of the following theorem is applicable for both linear and nonlinear circuits? CO1- U  
(a) Superposition theorem.                      (b) Thevenin's theorem  
(c) Norton's theorem                      (d) none of the above
3. If the lower cutoff frequency is 2400 Hz and the upper cutoff frequency is 2800 Hz. What is the bandwidth? CO1- U  
(a) 400 Hz                      (b) 2800 Hz                      (c) 2400 Hz                      (d) 5200 Hz
4. The time constant of a series RC circuit is CO1- U  
(a)  $1/RC$                       (b)  $R / C$                       (c)  $RC$                       (d)  $e^{-RC}$
5. Which elements act as independent variables in Y-parameters? CO1- U  
(a) Current                      (b) Voltage                      (c) Both A & B                      (d) Power

PART – B (5 x 3= 15 Marks)

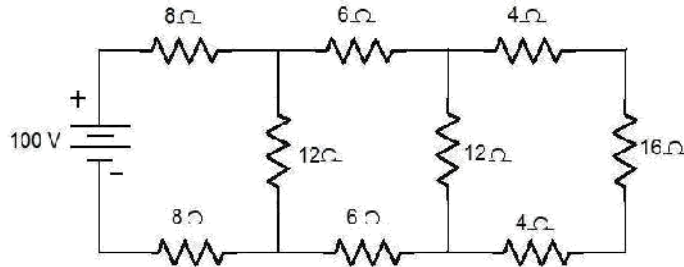
6. Define active elements and passive elements. CO1- U
7. State norton's theorem and draw its equivalent circuit.. CO1- U
8. In a parallel resonance circuit the value of  $R=10\Omega$ ,  $C=0.01\mu F$ ,  $L=2mH$ . Find the resonant frequency and bandwidth of the circuit CO4- App

9. What is transient and transient time? CO1- U

10. Give the expression of h-parameters in terms of Z-parameters CO1- U

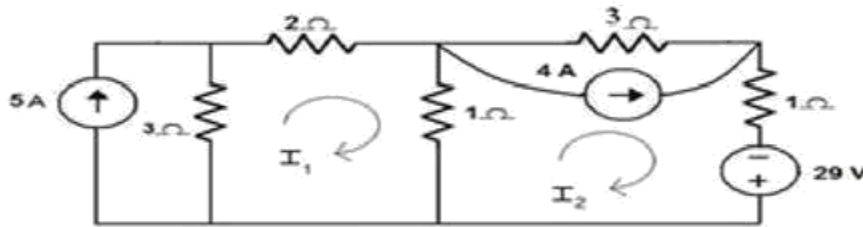
PART – C (5 x 16= 80Marks)

11. (a) Calculate (a) the equivalent resistances across the terminals of the supply, (b) total current supplied by the source and (c) power delivered to 16 ohm resistor in the circuit shown in figure CO2- App (16)

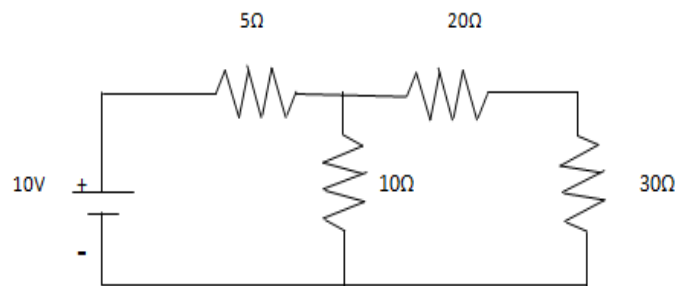


Or

(b) Analyze the mesh currents  $I_1$  and  $I_2$  for the given circuit shown below CO2- App (16)

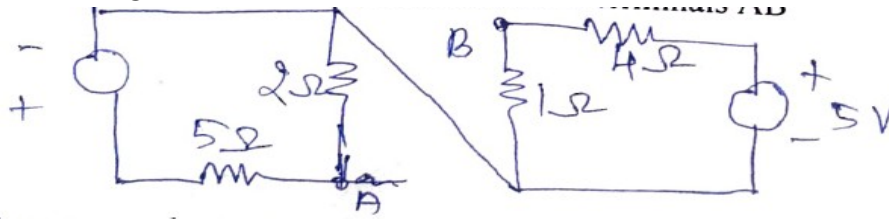


12. (a) For the circuit shown in figure, find the current through 30 ohms load resistor using Norton's theorem. CO3-App (16)



Or

- (b) Determine the Thevenin's equivalent circuit between the terminals AB in the given network. CO3- App (16)



13. (a) Obtain the resonant frequency, Q- factor, bandwidth and voltage across the capacitor at resonance for the series RLC circuit having  $R = 7.5 \Omega$ ,  $L = 6\mu\text{H}$  and  $C = 40\text{pF}$ , with a Supply voltage of 0.5 volts CO4- App (16)

Or

- (b) Explain and derive the relationship for bandwidth and half power frequencies of RLC series circuit. CO4- App (16)

14. (a) A series circuit consists of R-L in series with switch and supply voltage E. Derive the transient current  $i(t)$  when the switch is closed at  $t=0$ . CO5-App (16)

Or

- (b) Derive the DC response of the series RLC circuit. Assume that inductance and capacitance are initially uncharged CO5-App (16)

15. (a) Prove that the 'g'-parameter are the inverse of h-parameters. CO6-E (16)

Or

- (b) Derive the expression for Z-parameters in terms of Y-parameters. CO6-E (16)

