



B.E DEGREE EXAMINATIONS: DECEMBER 2022

(Regulation 2018)

Third Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U18ECT3105: Network Theory

COURSE OUTCOMES

- CO1:** Illustrate various components of circuit and perform analysis of the electrical networks.
CO2: Apply circuit theory concepts / theorems to compute DC circuit parameters
CO3: Apply circuit theory concepts / theorems to compute AC circuit parameters
CO4: Classify the different two port network parameters.
CO5: Interpret the transient response of RL, RC & RLC circuits.
CO6: Demonstrate the frequency response of resonance circuits.

Time: Three Hours

Maximum Marks: 100

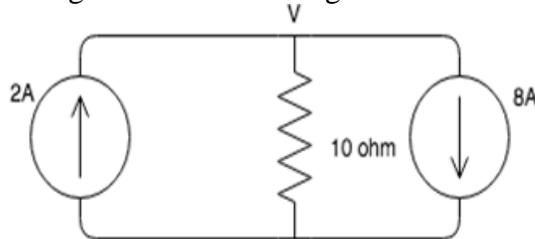
Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1. A 100V battery is connected across a resistor and causes a current of 5 mA to flow. Determine the resistance of the resistor. If the voltage is reduced to 25V, what will be the new value of the current flowing? CO1 [K₃]

2. Find the value of the node voltage V in the following circuit. CO1 [K₃]



3. Illustrate the Norton's equivalent circuit CO2 [K₂]
4. The voltage $v = 12 \cos(60t + 45^\circ)$ is applied to a 0.1-H inductor. Find the steady-state current through the inductor. CO3 [K₃]
5. Relate the h parameter with z parameter of a two-port network CO3 [K₂]
6. Interpret the amplitude, phase, period, and frequency of the sinusoid $v(t) = 12 \cos(50t + 10)$ CO4 [K₃]
7. Recall the steps required to find the step response of an RL circuit. CO5 [K₁]
8. Sketch the source free parallel RLC circuit and give its characteristic equation. CO5 [K₂]
9. State the dot convention rule. CO6 [K₁]

10. Two inductively coupled coils have self-inductance $L_1=50\text{mH}$ and $L_2 = 200\text{mH}$. If the coefficient of coupling is 0.5, compute the mutual inductance between the two coils.

CO6 [K₃]

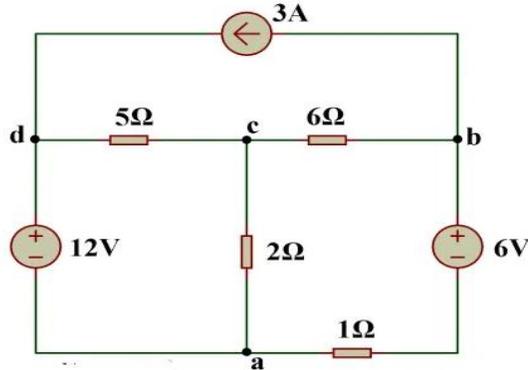
Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

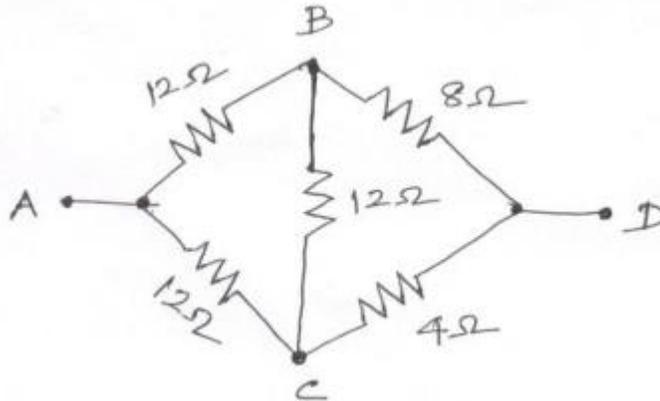
11. a) Apply mesh analysis to determine the node voltages and the current through the resistors of the network shown in figure below.

10 CO1 [K₃]



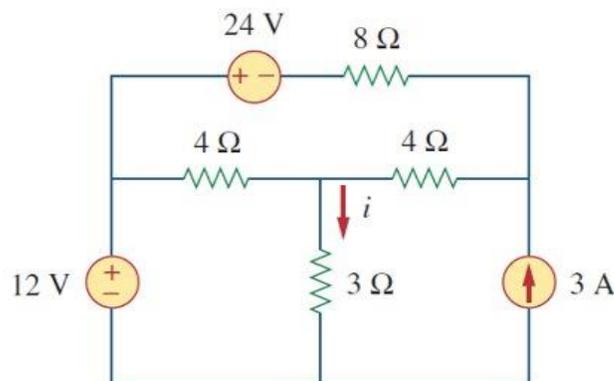
- b) Compute the equivalent Resistance R_{AD} in the circuit below.

6 CO1 [K₃]

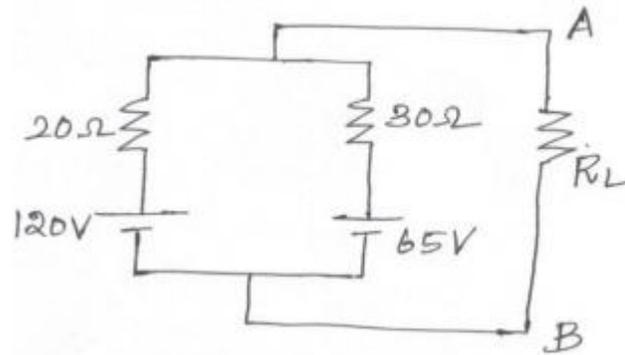


12. a) Make use of the superposition theorem to find i in the circuit in Figure below.

10 CO2 [K₃]



- b) For the circuit shown in figure below, determine the current flowing in the 6 CO2 [K₃]
resistance R_L using Thevenin's theorem.

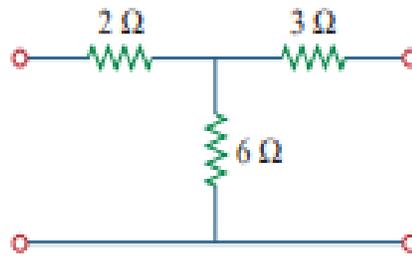


13. a) Evaluate these complex numbers: 6 CO3 [K₃]

(i) $(40\angle 50^\circ + (20\angle -30^\circ))^{1/2}$

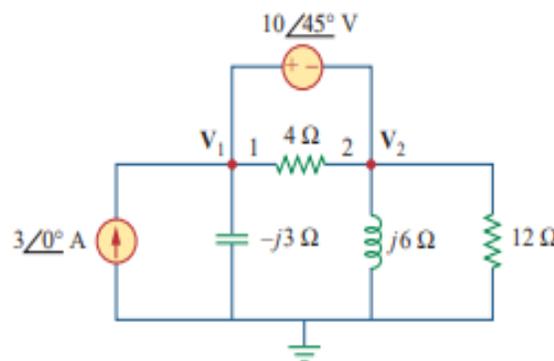
(ii) $\frac{10\angle -30^\circ + (3-j4)}{(2+j4)(3-j5)^*}$

- b) Predict the hybrid parameters for the two-port network of Figure shown below. 10 CO3 [K₃]

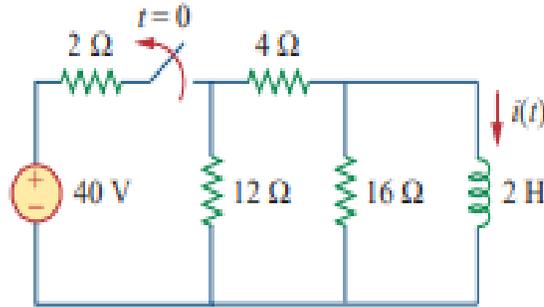


14. a) The voltage across a load is $v(t) = 60 \cos(\omega t - 10^\circ)$ V and the current through the 10 CO4 [K₃]
element in the direction of the voltage drop is $i(t) = 1.5 \cos(\omega t + 50^\circ)$ A. Find: (i)
the complex and apparent powers (ii) the real and reactive powers, and (iii) the
power factor and the load impedance

- b) Make use of the nodal analysis method to compute V_1 and V_2 in the circuit shown 6 CO4 [K₃]
in the figure below.

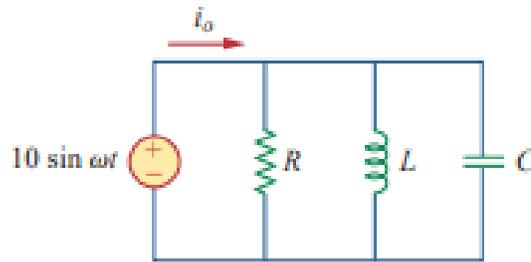


15. a) The switch in the circuit shown below has been closed for a long time. At $t = 0$, the switch is opened. Calculate $i(t)$ for $t > 0$. 10 CO5 [K₃]



- b) In a source free series RLC circuit, if $R = 40\Omega$, $L = 4H$, $C = 1/4 F$, Calculate the characteristic roots of the circuit. Is the natural response overdamped, underdamped or critically damped? Justify your answer. 6 CO5 [K₃]

16. a) In a parallel RLC circuit in the figure below, let $R = 8K\Omega$, $L = 0.2mH$, $C = 8\mu F$. (i) Calculate ω_0 , Q and Bandwidth (ii) Find ω_1 and ω_2 (iii) Determine the power dissipated at ω_1 , ω_2 and ω_3 . 12 CO6 [K₃]



- b) Consider the circuit below, calculate the input impedance and current I_1 . Take $Z_1 = 60 - j100\Omega$, $Z_2 = 30 + j40\Omega$, $Z_3 = 80 + j60\Omega$. 4 CO6 [K₃]

