Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Third Semester

EC18303 – CIRCUIT THEORY

(Electronics and Communication Engineering)

(Regulation 2018/2018A)

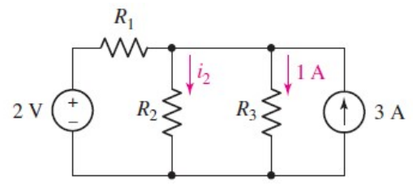
TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Determine the characteristics of electrical circuits by applying circuit laws.	3
CO 2	Compare the phasor diagram of R, L and C and analyze the AC circuit power.	4
CO 3	Infer the phenomenon of series and parallel resonance in electrical circuits and understand the effect of magnetic coupling between windings.	4
CO 4	Compare the characteristics of RC, RL and RLC circuits for AC and DC inputs and evaluate the two port network parameters.	4
CO 5	Sketch the various network topologies.	4

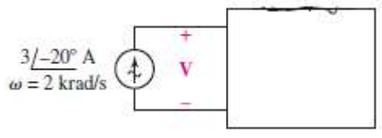
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

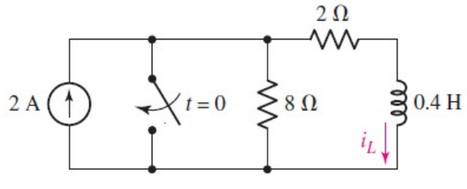
		CO	RBT LEVEL
1.	A bulb is rated as 230V, 230W. Find the rated current and the resistance of the filament.	1	3
2.	If 2V source is supplying a current of 7A, Calculate the current i_2.	1	3



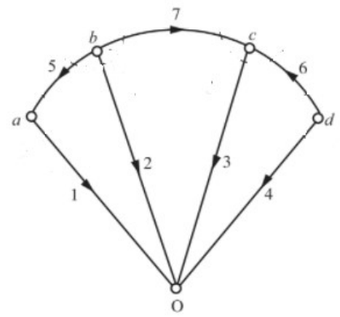
3.	Find V in the circuit shown below, if the box contains 3Ω in series with 2 mH.	2	3



4.	A load draws 5kVAR at a power factor 0.86 (leading) from a 220-Vrms source. Calculate the apparent power supplied by the load.	2	3
5.	Define Quality factor.	3	1
6.	A coil having an inductance of 33mH is magnetically coupled to another coil having an inductance of 47mH. The coefficient of coupling between the coils is 0.6. Calculate the equivalent inductance if the two coils are connected in series aiding.	3	3
7.	Determine time constant (τ) for the given RL circuit.	4	3

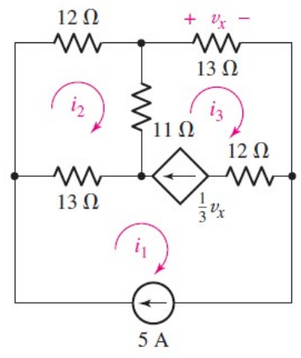


8.	The impedance parameters of the two-port network are input driving impedance = 6Ω, forward transfer impedance = 3Ω, output driving impedance = 6Ω and reverse transfer impedance = 3Ω. Compute hybrid parameters.	4	3
9.	Define planar and nonplanar graph.	5	1
10.	For the given directed graph, obtain the incidence matrix (A) and list out the nodes with degree '2'.	5	3



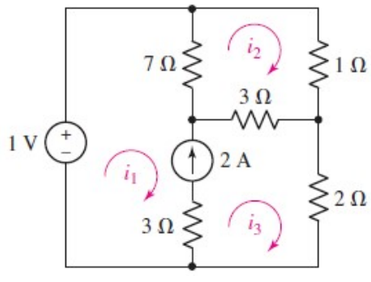
PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Determine v_x and power absorbed by 11Ω resistor.	(14)	1	3

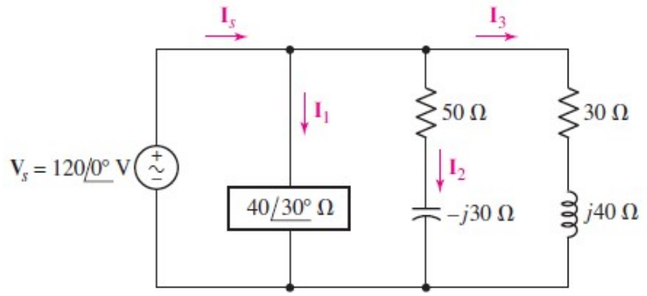


(OR)

(b)	Determine all the mesh current and the power absorbed by 1Ω resistor.	(14)	1	3

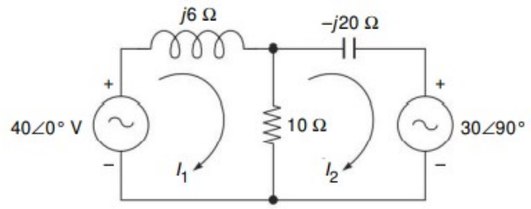


12. (a)	In the given circuit, find values for $\mathbf{I}_1$, $\mathbf{I}_2$, and $\mathbf{I}_3$ and represent $\mathbf{V}_s$, $\mathbf{I}_1$, $\mathbf{I}_2$, and $\mathbf{I}_3$ on a phasor diagram. Also determine the angle by which $\mathbf{I}_s$ leads $\mathbf{I}_1$, $\mathbf{I}_2$, and $\mathbf{I}_3$.	(14)	2	3

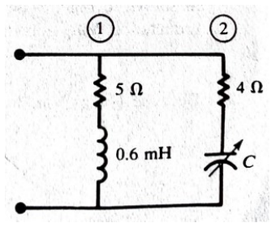


(OR)

(b) For the given circuit, find the complex power delivered by all the voltage sources. **(14) 2 3**



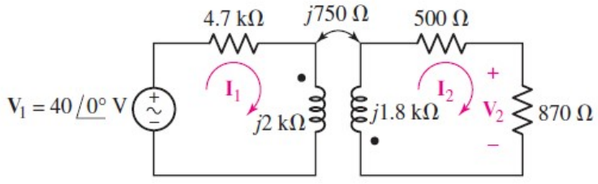
13. (a) (i) Determine the value(s) of C for which the circuit shown is resonant at 5000 rad/s. **(10) 3 3**



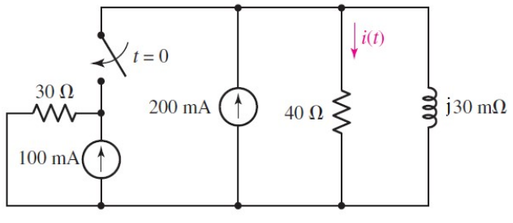
(ii) A RLC series circuit consists of R=16Ω, L=2mH and C=2μF. Calculate resonant frequency and Quality factor. **(4) 3 3**

(OR)

(b) For the given circuit, determine the mesh current I_1 and I_2. **(14) 3 3**

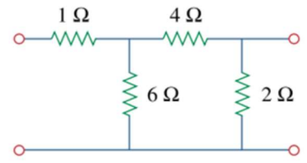


14. (a) Obtain an expression for $i(t)$ as labeled in the circuit diagram, and determine the power dissipated in the 40Ω resistor at $t = 2.5$ ms. **(14) 4 3**

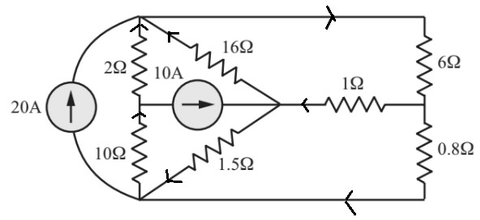


(OR)

(b) Determine the admittance parameters for the given circuit. **(14) 4 3**

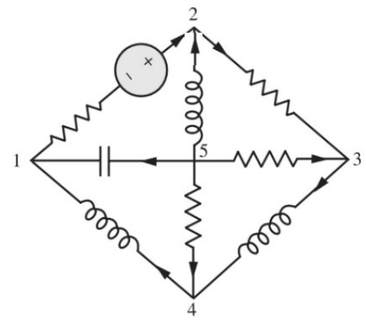


15. (a) For the given network, obtain the incidence matrix (A) and cut-set matrix (C). Also, express the branch voltages in terms of twig voltages. **(14) 5 3**



(OR)

(b) (i) For the given network, determine the incidence matrix (A) and Tie-set matrix (B). Also, express branch currents in terms of loop currents. **(14) 5 3**



PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	With regard to the circuit represented below, determine (*a*) $i_L(0-)$; (*b*) $i_R(0-)$; (*c*) $v_C(0-)$; (d) $v_C(0+)$.	**(10)**	**4**	**3**