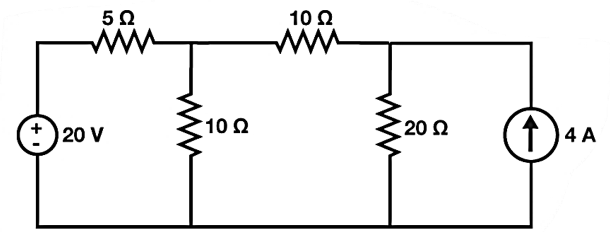
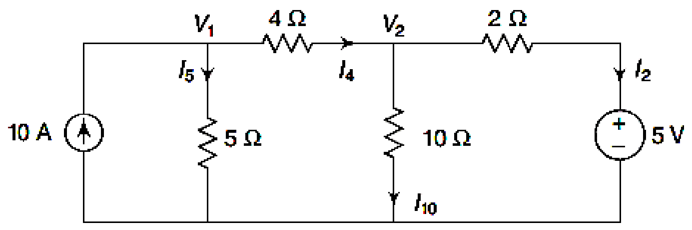
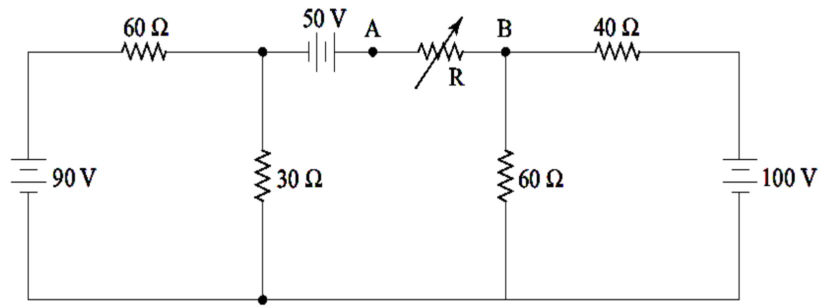
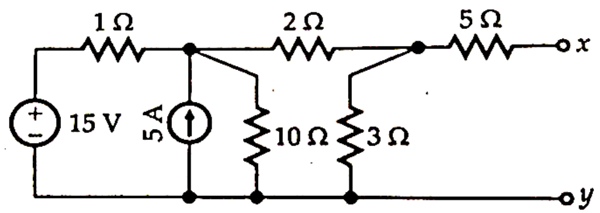
SCHOOL OF ELTECTRICAL AND ELECTRONICS ENGINEERING

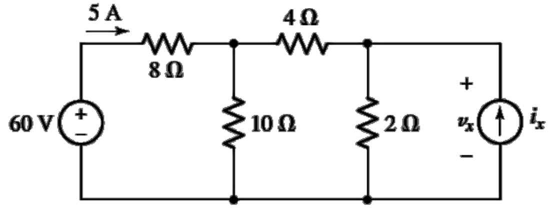
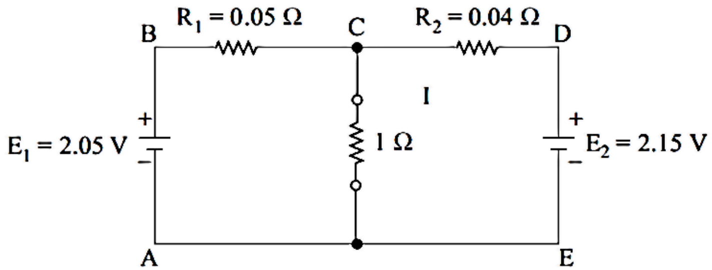
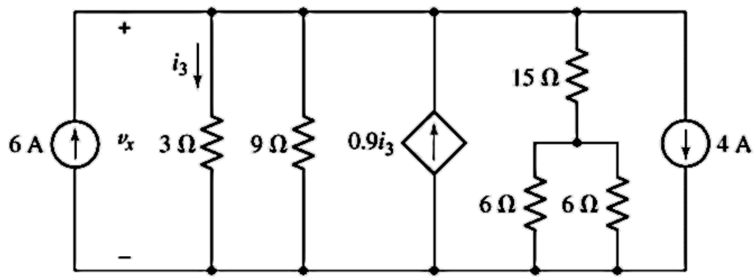
EEE1001 -Electric Circuits and Systems Question Bank

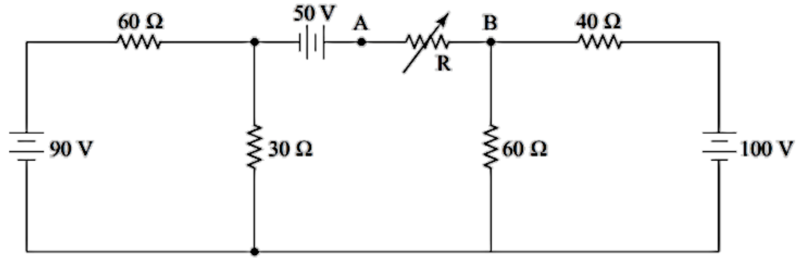
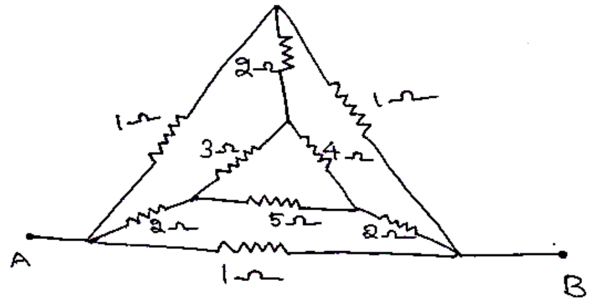
INTERIM SEMETER 2024-2025

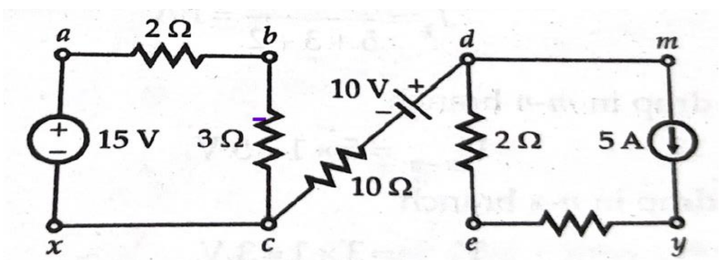
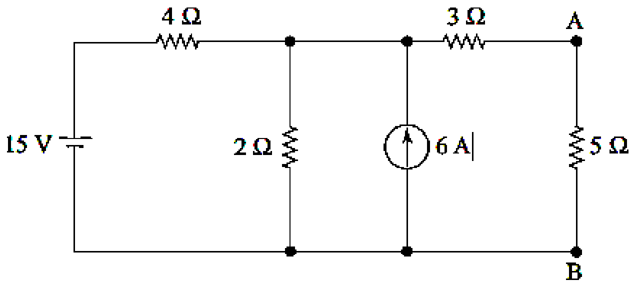
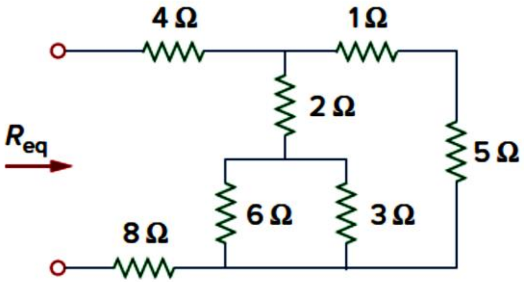
MODULE -1

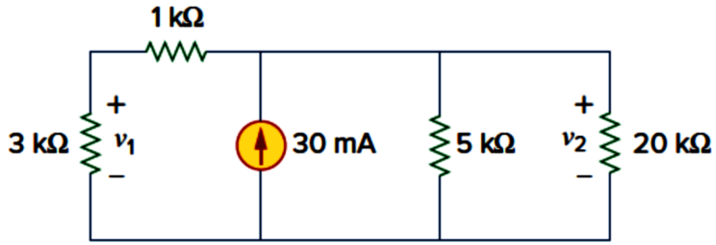
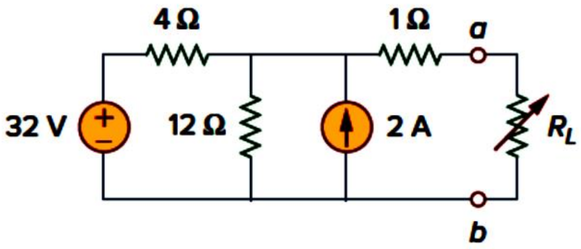
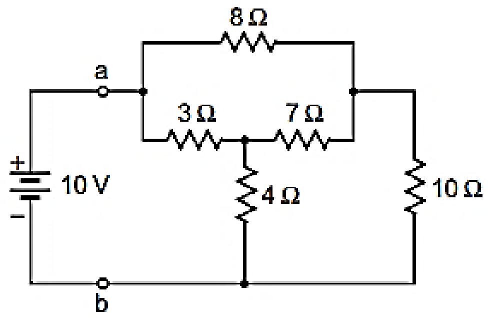
SL.NO	QUESTIONS	MARKS	KNOWLEDGE LEVEL	COURSE OUTCOME
1.	Find the current flowing through 20 Ω shown in figure using the superposition theorem, Thevenin's and Norton's theorem. 	5	KL3	**CO1**
2.	For the given circuit shown in Figure, write node voltage equations and determine currents in each branch for given network.	10	KL3	**CO1**

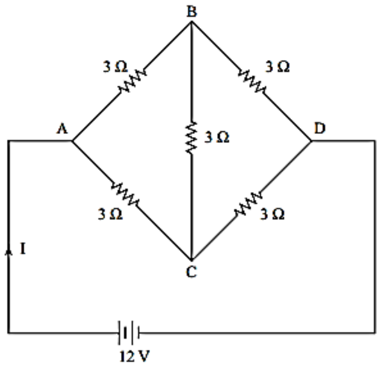
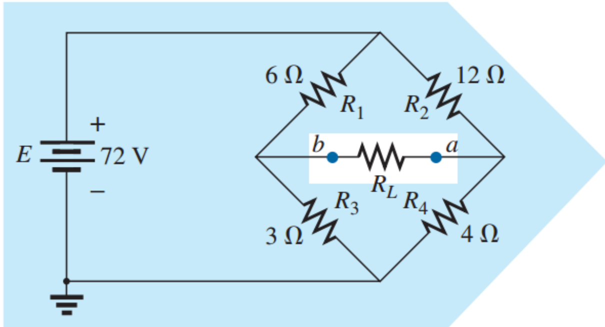
				
3.	Using Thevenin's theorem calculate the range of current flowing through the resistance R when its value is varied from 6 W to 36 W. 	10	**KL3**	**CO1**
4.	What resistance should be connected across x-y in the circuit shown in figure such that maximum power is developed across this load resistance? What is the amount of this maximum power? 	5	KL3	**CO1**

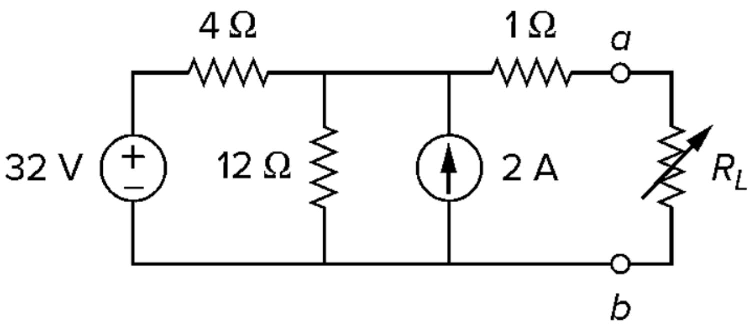
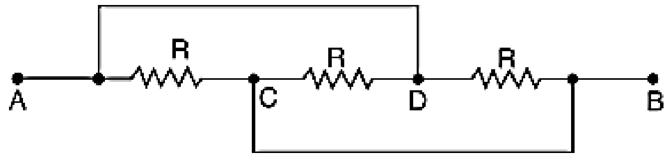
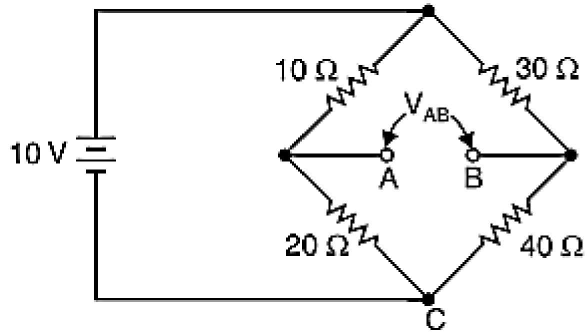
5.	Determine V_X in the circuit. 	5	KL3	**CO1**
6.	State Norton's theorem with a neat diagram of the Norton's equivalent circuit. Two batteries of EMF 2.05 V and 2.15 V having internal resistances of 0.05 Ω and 0.04 Ω, respectively are connected together in parallel to supply a load resistance of 1 Ω. Calculate using the superposition theorem, current supplied by each battery and also the load current. 	10	KL2	**CO1**
7.	Calculate the voltage of the dependent source. 	10	KL3	**CO1**

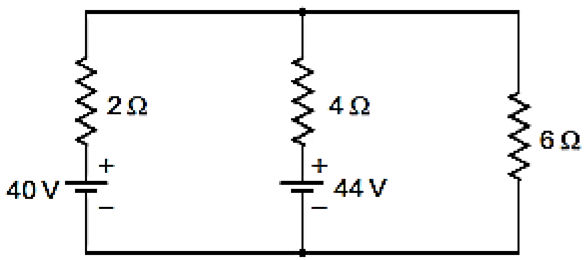
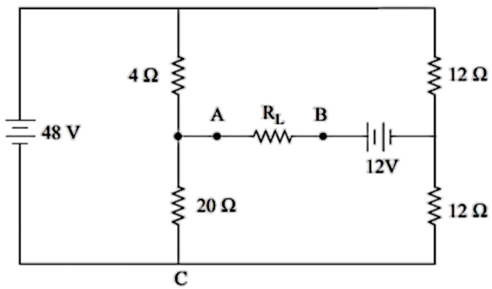
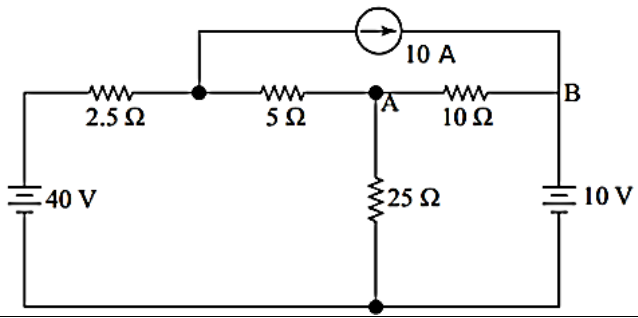
8.	State Superposition theorem. Using Thevenin’s theorem calculate the range of current flowing through the resistance R when its value is varied from 6 Ω to 36 Ω. 	10	KL3	**CO1**
9.	Find the equivalent resistance across the terminals A and B of the network shown in figure using Star-delta transformation. 	5	KL2	**CO1**

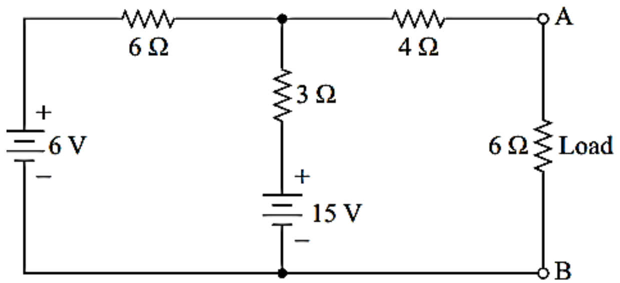
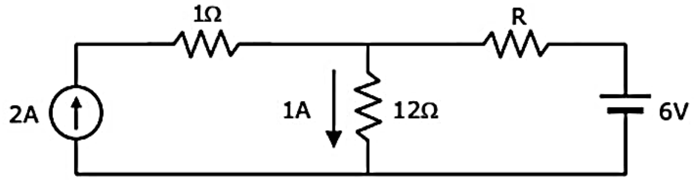
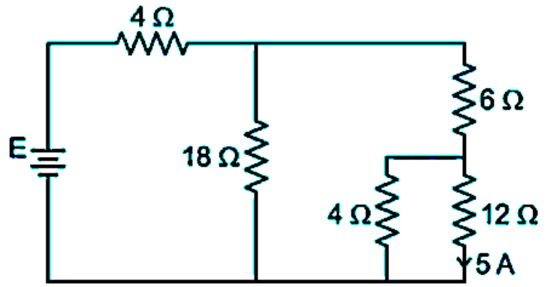
<table>
<tr><td>10.</td><td>Find the voltage drop between the terminals a-e.

</td><td>5</td><td>KL3</td><td>CO1</td></tr>
<tr><td>11.</td><td>Calculate using Thevenin’s theorem the current flowing through the 5 Ω resistor connected across terminals A and B as shown in figure.

</td><td>10</td><td>KL3</td><td>CO1</td></tr>
<tr><td>12.</td><td>Find Req for the circuit shown in the following figure.

</td><td>5</td><td>KL2</td><td>CO1</td></tr>
<tr><td>13.</td><td>For the circuit shown in Figure, find: (a) v_1 and v_2, (b) the power dissipated in the 3kΩ and 20kΩ resistors, and (c) the power supplied by the current source.</td><td>10</td><td>KL3</td><td>CO1</td></tr>
</table>

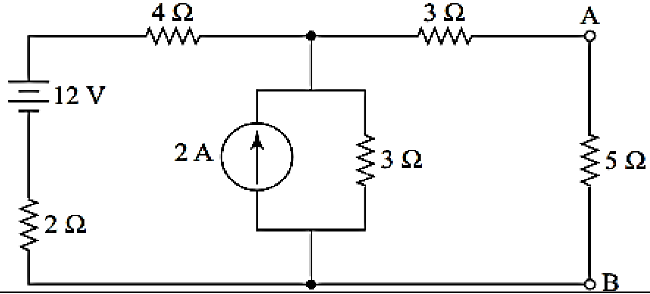
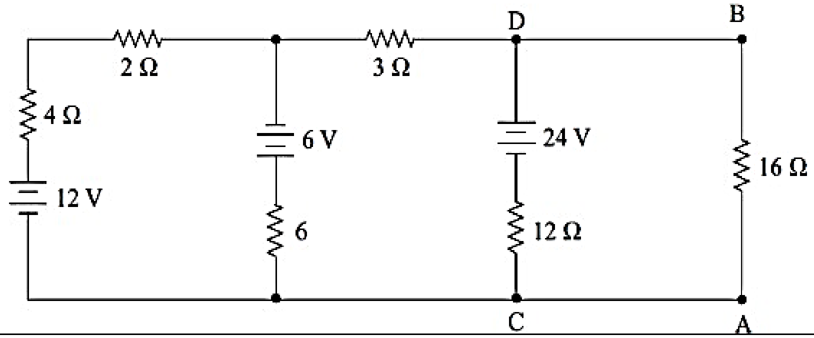
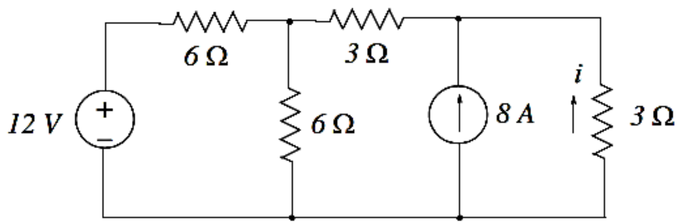
				
14.	Find the Thevenin equivalent circuit of the circuit shown in Figure, to the left of the terminals a-b. Then find the current through RL = 6, 16, and 36 Ω. 	10	KL3	**CO1**
15.	Using delta to star transformation, determine the resistance between terminals a and b and the total power drawn from the supply in the circuit shown in Figure. 	10	KL2	**CO1**
16.	Calculate the current, I supplied by the battery in the circuit shown in Figure.	10	KL2	**CO1**

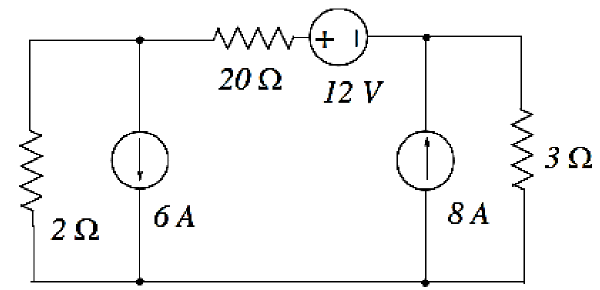
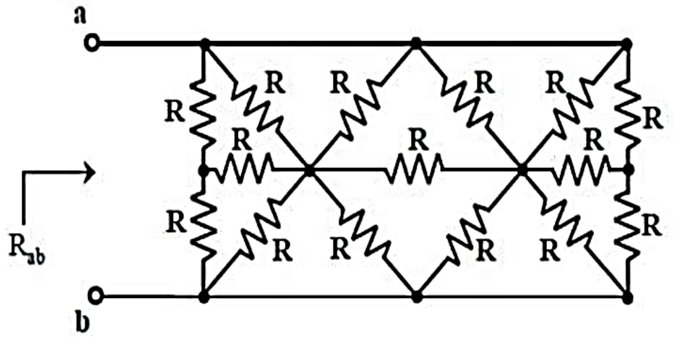
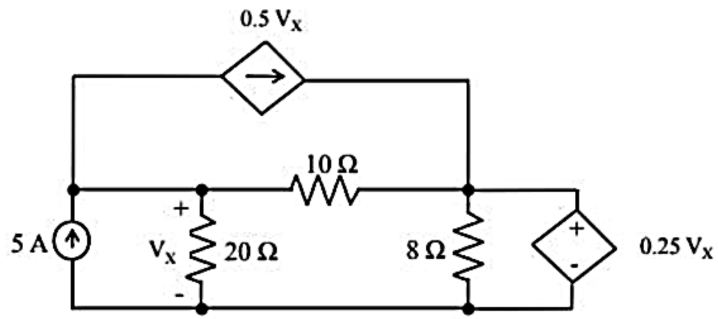
				
17.	In the circuit shown in the Figure, Determine the value of R_L for which the maximum power will be transfer, also find the maximum power transferred to the load. 	10	KL3	**CO1**
18.	Transform the circuit given in Figure into Norton equivalent Circuit across terminal a-b and determine the current across the load resistance taking R_L= 6 ohm.	10	KL3	**CO1**

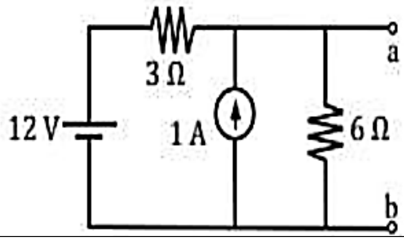
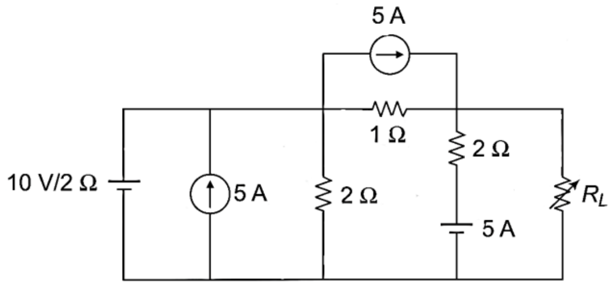
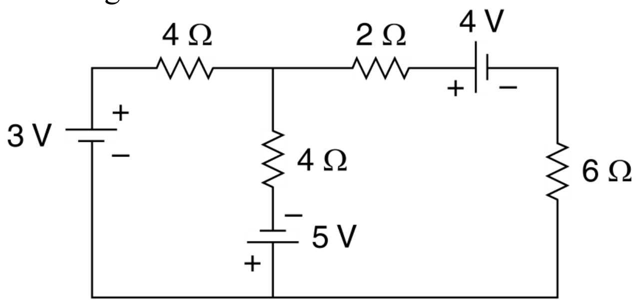
				
19.	Three equal resistors are connected as shown in Figure. Find the equivalent resistance between points A and B. 	4	KL2	**CO1**
20.	Find the voltage V_{AB} in the circuit shown in Figure. 	5	KL3	**CO1**
21.	Figure shows two batteries connected in parallel, each represented by an emf along with its internal resistance. A load resistance of 6 Ω is connected across the ends of the batteries. Calculate the current through each battery and the load.	6	KL2	**CO1**

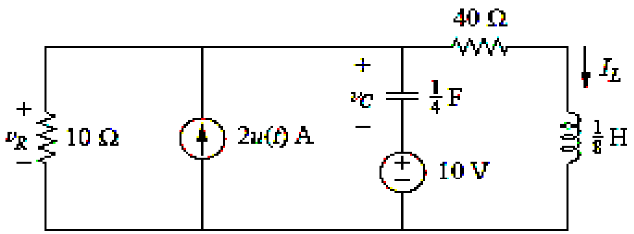
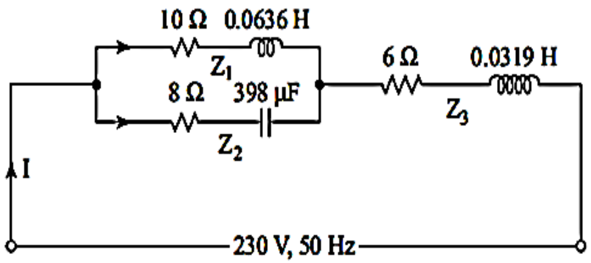
				
22.	Calculate the value of load resistance, R_L for which maximum power will be transferred from the source to the load and the value of the maximum power. Also, calculate the maximum power transfer efficiency. 	10	KL3	**CO1**
23.	By using the superposition theorem calculate the current flowing through the 10 Ω resistor in the network shown.as shown in Figure is 	10	KL3	**CO1**

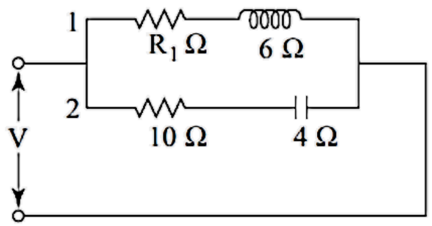
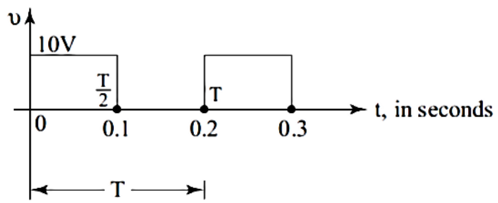
24.	Determine the current through the 6Ω resistance connected across the terminals A and B in the electric circuit shown in Figure. 	10	KL3	**CO1**
25.	Find the value of R if 12Ω resistor draw 1 A current as shown in Figure. Also find the power absorbed in the R resistor. 	10	KL2	**CO1**
26.	Find the value of E , the current in the 12 ohm is 5 A as shown below. 	10	KL3	**CO1**

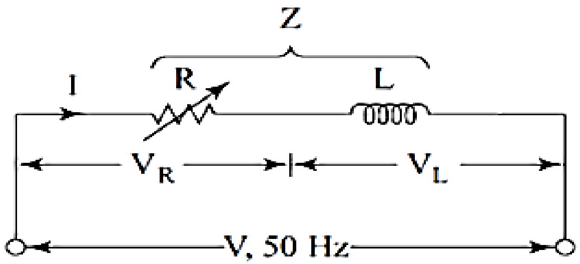
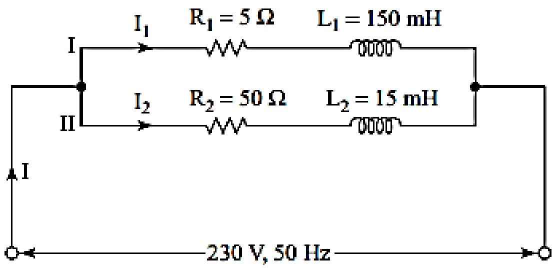
27.	Using Thevenin's theorem to calculate the current flowing through the 5 Ω resistor in the circuit shown in Figure. 	10	KL3	**CO1**
28.	By applying Thevenin's as well as Norton's theorem show that current flowing through the 16 Ω resistance in the following network is 0.5 A. 	10	KL3	**CO1**
29.	State ohm's law. State and explain maximum power transfer theorem for DC circuits with suitable example	10	KL1	**CO1**
30.	Find the value of the current **i** for the circuit shown in Figure. Calculate the power delivered by 8A current source. 	10	KL3	**CO1**

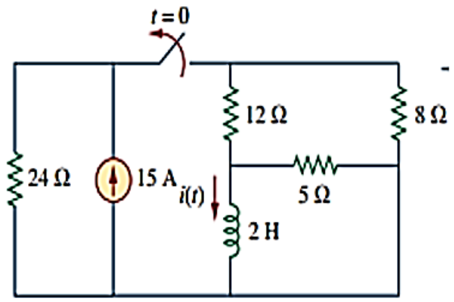
31.	Compute the power absorbed by the 3-ohm resistor in the circuit of Figure using any method of your choice. 	10	KL3	**CO1**
32.	Find R_{ab}. (R=900) 	10	KL3	**CO1**
33.	In the circuit shown , find the voltage V_X(in volts) 	10	KL3	**CO1**

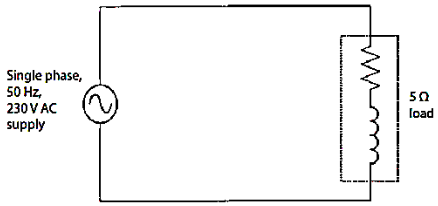
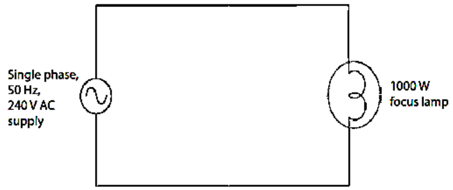
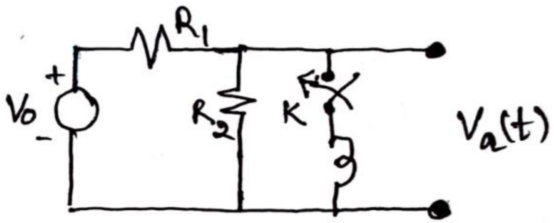
<table>
<tr><td>34.</td><td>For the circuit shown in figure, find the thevenin’s equivalent voltage in volts across teriminals a-b.

</td><td>10</td><td>KL3</td><td>CO1</td></tr>
<tr><td>35.</td><td>Find the value of R_L for maximum power transfer and calculate maximum power in the given circuit shown in Figure.

</td><td></td><td></td><td></td></tr>
<tr><td>36.</td><td>Find current in 6Ω resistor using Norton’s theorem for the network shown in Figure

</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">MODULE - 2</td></tr>
</table>

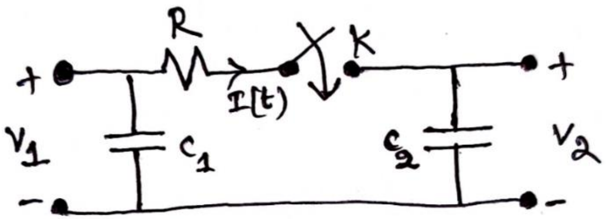
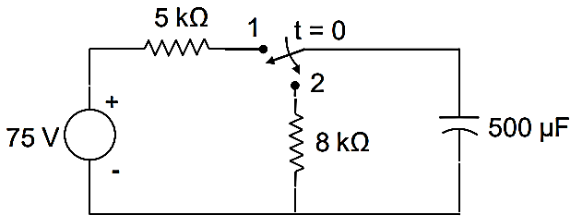
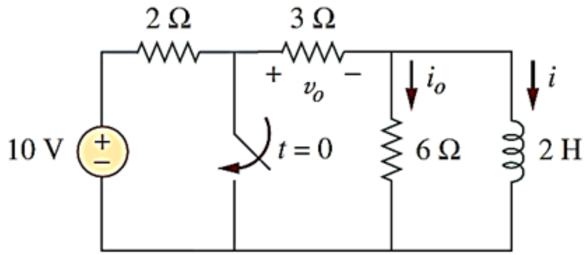
SL.NO	QUESTIONS	MARKS	KNOWLEDGE LEVEL	COURSE OUTCOME
1.	Refer to the circuit shown in Figure below. Calculate (i) $i_L(0^+)$, $v_C(0^+)$ and $v_R(0^+)$ (ii) $di_L(0^+)/dt$, $dv_C(0^+)/dt$ and $dv_R(0^+)/dt$ (iii) $i_L(\infty)$, $v_C(\infty)$ and $v_R(\infty)$. 	10	KL3	**CO2**
2.	Determine the total current drawn from the supply by the series–parallel circuit shown in Figure. Also calculate the power factor of the circuit. 	10	KL3	**CO2**
3.	A circuit having a resistance of 12 Ω, an inductance of 0.15 H and a capacitance of 100 μF in series, is connected across a 100 V, 50 Hz supply. Calculate: (a) the total impedance; (b) the current drawn; (c) the voltages across R, L and C; (d) the phase difference between the current and the supply voltage.	10	KL3	**CO2**
4.	Calculate the value of R_1 such that the circuit will resonate.	6	KL2	**CO2**

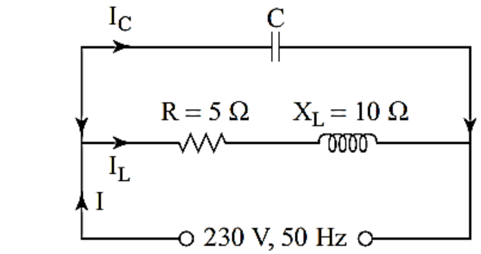
				
5.	Consider a linear time inverse system given by $$\frac{d^2y(t)}{dt^2}+7\frac{dy(t)}{dt}+10y(t)=\frac{dx(t)}{dt}+6x(t)$$ $$x(t)=e^{-2t}\,u(t)$$ Find the natural response, forced response, and total response for initial condition: $y(0)=6, \frac{dy(0)}{dt}=-4.$	10	KL4	**CO2**
6.	Calculate the RMS value, average value and form factor of a half-rectified square voltage. 	6	KL3	**CO2**
7.	A variable resistance R and an inductance L of value 100 mH in series are connected across at 50 Hz supply. Calculate at what value of R the voltage across the inductor will be half the supply voltage.		KL3	**CO2**

				
8.	In a series R-L-C circuit, the following values are known. V = 230 v, f = 50 Hz, L = 20mH, R = 20Ω, C = 0.01μF. Find impedance Z, Current I, power factor and Power consumed P.	10	KL3	**CO2**
9.	For the circuit shown in Fig. calculate the total current drawn from the supply. Also calculate the power and power factor of the circuit also draw the phasor diagram. 	10		**CO2**
10.	A series *RLC* circuit with L =160 mH, C = 100 μF, and R = 40.0Ω is connected to a sinusoidal voltage $V(t) = 40\sin\omega t$, with ω = 200 rad/s (i) What is the impedance of the circuit? (ii) Let the current at any instant in the circuit be $I(t) = I_0 \sin(\omega t - \varphi)$. Find I_0. (iii)What is the power factor?	10	KL3	**CO2**
11.	For the first order circuit shown in the Figure, determine i(t) for t >0.	10	KL4	**CO2**

				
12.	A capacitor has a capacitance of 30 μF. Find its capacitive reactance for frequencies of 25 and 50 Hz. Find in each case the current if the supply voltage is 440 V.	10	KL3	**CO2**
13.	A 100 μF capacitor is connected across a 230 V, 50 Hz supply. Determine (i) the maximum instantaneous charge on the capacitor and (ii) the maximum instantaneous energy stored in the capacitor.	10	KL3	**CO2**
14.	An inductive coil having negligible resistance and 0.1 Henry inductance is connected across a 200 V, 50 Hz supply. Find I. Inductive reactance, II. Rms value of current, III. Power, IV. Power factor, and V. Equations for voltage and current.	10	KL3	**CO2**
15.	The voltage and current through a circuit element are $v = 50\sin(314t + 55^{o})V$ $i = 10\sin(314t + 325^{o})A$ Find the value of power drawn by the element.	8	KL3	**CO2**
16.	A 5Ω load at 0.8 PF connected across single phase, 240 V AC supply as shown in Figure. Calculate the reactive power drawn by the load.	8	KL3	**CO2**

				
17.	A single-phase, 1000W focus lamp draws 4.6A current in a 240V AC supply as shown in Figure. Calculate the apparent power. 	8	KL3	**CO2**
18.	A coil having a resistance of 5Ω and inductance of 30mH in series are connected across a 230 V, 50 Hz supply. Calculate current, power factor, power consumed and draw the phasor diagram.	10	KL3	**CO2**
19.	A 50 Hz sinusoidal current has a peak factor of 1.4 and a form factor of 1.1. Its average value is 20A. The instantaneous value of the current is 15 A at t = 0. Write the equation of the current and draw its waveform.	5	KL3	**CO2**
20.	In the network, Switch K is ON at t=0. Find $V_a(t)$. 	8	KL4	**CO2**

21.	In the Network shown in figure, Switch K is ON at t=0. Find (i) I(t), (ii) $V_1(t)$, (iii) $V_2(t)$.  	8	KL4	**CO2**
22.	The switch in the circuit shown was in open position for a long time. It is closed at time t = 0. Find $i_L(t)$ for time t > 0.  	8	KL4	**CO2**
23.	In the circuit shown in Figure, find and *i* for all time, assuming that the switch was open for a long time.  	10	KL4	**CO2**
24.	In the given circuit derive the expression for the resonant frequency and the impedance at resonance. Also draw the phasor diagram of the resultant voltage and current.	12	KL3	**CO2**

<table>
<tr><td></td><td>
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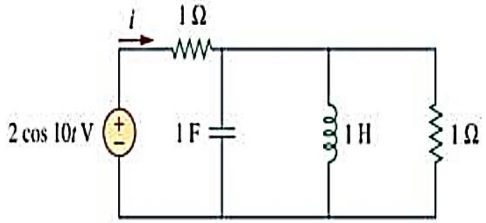
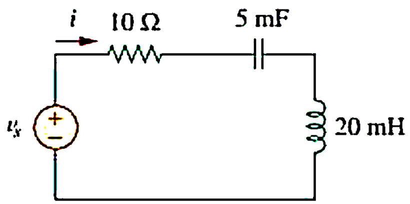
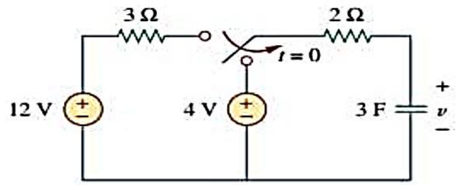
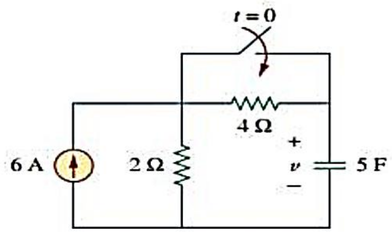
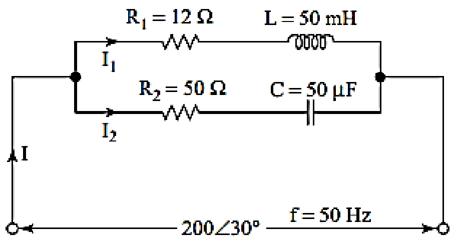
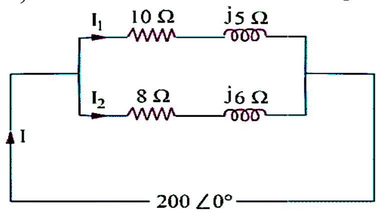
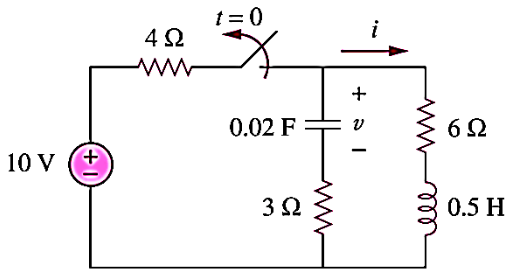
<tr><td>25.</td><td>Determine the current (i) in Figure

</td><td>8</td><td>KL3</td><td>CO2</td></tr>
<tr><td>26.</td><td>Find current i in the circuit of, $\boldsymbol{when\ v_s(t) = 50\ cos\ 200t\ V}$

</td><td>8</td><td>KL3</td><td>CO2</td></tr>
<tr><td>27.</td><td>Find the capacitor voltage for $t > 0$ for each of the circuits given in Figure</td><td>10</td><td>KL4</td><td>CO2</td></tr>
</table>

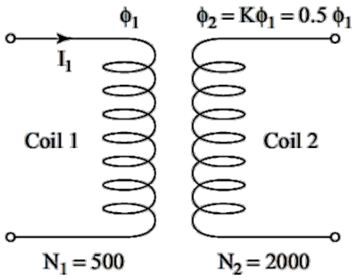
	 (a)  (b)			
28.	Two impedances Z1 and Z2 are connected in parallel across a 230 V, 50 Hz supply. The impedance, Z1 consists of a resistance of 14 Ω and an inductance of 16 mH. The impedance, Z2 consists of a resistance of 18 Ω and an inductance of 32 mH. Calculate the branch currents, line currents, and total power factor. Draw the phasor diagram showing the voltage and currents.	12	KL3	**CO2**
29.	Consider a second order continuous system given by $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = -3\frac{dx(t)}{dt} - 4x(t)$ The input is $x(t) = e^{-t}\,u(t)$. Find, (i) Natural response (ii) Forced response. (iii) Total response. for initial condition: $y(0^+) = -1, \frac{dy(0^+)}{dt} = 5$	12	KL4	**CO2**
30.	For the circuit shown in Figure, calculate the total current, power, and power factor of the whole circuit. Also draw the phasor diagram	12	KL3	**CO2**

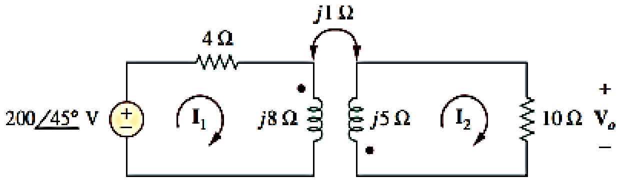
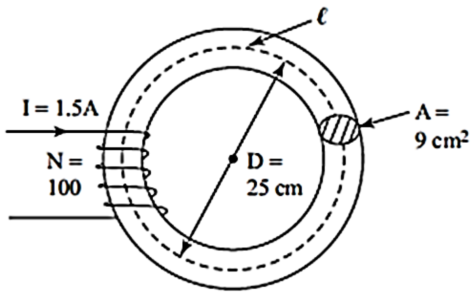
				
31.	A resistor, a variable iron-core inductor, and a capacitor are connected across a 230 V, 50 Hz supply. By varying the position of the iron core inside the inductor coil, its inductance is changed. Maximum current of 1.5 A was obtained in the circuit by changing the inductance of the coil. At that time the voltage across the capacitor was measured as 600 V. Calculate the values of circuit parameters.	12	KL3	**CO2**
32.	Two impedances given by $Z_1 = (10 + j\ 5)$ and $Z_2 = (8 + j\ 6)$ are connected across a voltage of V. Find the circuit current I, its phase, and the branch current I_1 and I_2. Draw the vector diagram. 	10	KL3	**CO2**
33.	For the given circuit, find i(t). 	10	KL4	**CO2**

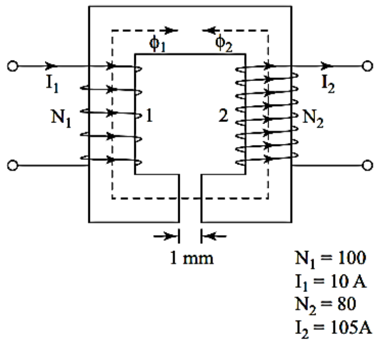
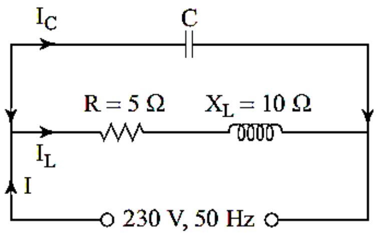
34.	Consider a linear time inverse continuous system given by $\frac{d^2y(t)}{dt^2} - 9\frac{dy(t)}{dt} + 14y(t) = \frac{dx(t)}{dt} + 2x(t)$ the input is $x(t) = e^{-3t}u(t)$. Find, (i) Natural response (ii) Forced response. (iii) Total response. for initial condition $y(0^+) = 9, \frac{dy(0^+)}{dt} = 0$	12	KL4	**CO2**
35.	A choke coil is connected across a variable AC supply, the voltage of which is kept constant at 220V,50 HZ., an ammeter in the circuit reads 60A, on increasing the frequency to 100 Hz, the current fall to 40 A. Calculate the parameters of choke coil.	10	KL3	**CO2**
36.	A resistance of 50Ω, inductance of 29.8mH, Capacitance of 3.4μF Capacitor are connected in series across a 200V, 250HZ AC Supply. Find (a) Impedance of circuit (b) Current (c) Power consumed in the circuit (d) Power factor (e) Voltage drop across resistance (f) Voltage drop across Inductance (g) Voltage drop across Capacitance. Also draw the phasor diagram for the circuit.	12	KL3	**CO2**
37.	In a series R-L-C circuit, the following values are known. V = 230V, f = 50 Hz, L = 20mH, R = 20Ω, C = 0.01μF. Find impedance Z, Current I, power factor and Power consumed P.	10	KL3	**CO2**

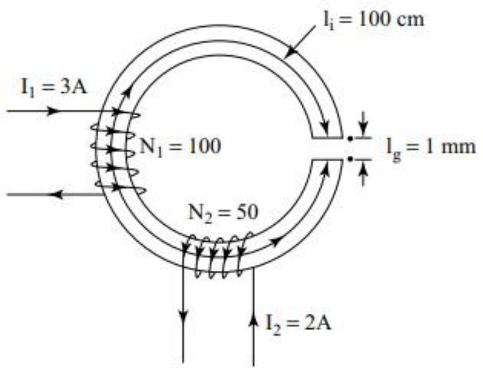
MODULE -3

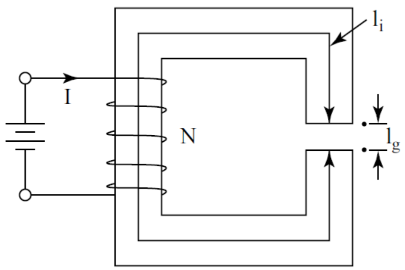
SL.NO	QUESTIONS	MARKS	KNOWLEDGE LEVEL	COURSE OUTCOME
1.	Compare and deduce the analogy between electric circuits and magnetics circuits. Find the magnetic core flux of a magnetic circuit with a relative permeability of 50 has a core cross section of 5 cm^2 and mean core length of 25 cm. The coil on the core has 120 turns with an MMF of 500 AT.	10	KL3	**CO3**
2.	A coil of 100 turns is wound uniformly over a insulator ring with a mean circumference of 2m and a uniform sectional area of 0.025cm2. If the coil is carrying a current of 2A. Calculate (a) the mmf of the circuit (b) magnetic field intensity (c) flux density (d) total flux.	10	KL3	**CO3**

3.	Two coupled coils with L1=0.02H, L2=0.01H and K=0.5 are connected in four different ways Series aiding, series opposing, parallel aiding and parallel opposing. Determine the equivalent Inductances in all the four cases?	10	KL3	**CO3**
4.	Explain the Principle of operation and working of induction machine	10	KL1	**CO3**
5.	State Ampere's Circuital Law. A current of 5 A flowing through a coil of 500 turns produces a flux of 1 mWb. Another coil is placed near this coil and current in this coil is suddenly reversed in 10 ms. As a result, the EMF induced in the second coil is measured as 50 V. Calculate self and mutual inductance of the coils assuming a coefficient of coupling as 60 %.	12	KL3	**CO3**
6.	A 100 kVA, 2400/240 V, 50 Hz transformer has a no-load current of 0.64 A and a core loss of 700 W, when its high-voltage side is energized at rated voltage and frequency. Calculate the components of the no-load current and no-load branch parameters of the equivalent circuit.	12	KL3	**CO3**
7.	There is mutual magnetic coupling between two coils of number of turns 500 and 2000, respectively. Only 50% of the flux produced by the coil of 500 turns is linked with the coil of 2000 turns. Calculate the mutual inductance of the two coils. Also calculate the EMF induced in the coil of 2000 turns when current changes at the rate of 10A/s in the other coil. The self-inductance of the coil of 500 turns in 200 mH. 	12	KL3	**CO3**
8.	A circular coil of radius r metres is carrying a current of I Amperes. Determine the magnetic field strength H at a point P which is situated at a distance of d metres from the centre of the coil. Also, determine the field strength at the centre of the coil. A single turn coil of radius 10 cm is carrying a current of 100A. Calculate (i) the flux density at the centre of the coil; (ii) the flux density in the perpendicular plane at a distance of 5 cm from the coil.	12	KL3	**CO3**
9.	Determine the voltage Vo in the given circuit shown in figure.	10	KL3	**CO3**

				
10.	A 25 kVA, 2000/200 V transformer has constant loss, i.e., iron loss of 350 W and full-load copper loss called the variable loss of 400 W. Calculate the efficiency of the transformer at full load and at half load 0.8 power factor lagging.	12	KL3	**CO3**
11.	A 20 kVA, 1000/200 V, 50 Hz has core loss and copper loss as 400 W and 600 W, respectively, under the full-load condition. Calculate the efficiency at full load 0.8 lagging power factor. At what percentage of full load will the efficiency be maximum and what is the value of maximum efficiency?	12	KL3	**CO3**
12.	With neat and clean diagram, Explain the construction, operation, and applications of DC motor.	10	KL1	**CO3**
13.	A circular iron ring of mean diameter 25 cm and cross-sectional area 9 cm^2 is wound with a coil of 100 turns and carries a current of 1.5 A. The relative permeability of iron is 2000. Calculate the amount of flux produced in the ring. 	12	KL3	**CO3**
14.	Explain the working of three phase transformer and compare single phase and three phase transformers.	10	KL1	**CO3**
15.	Explain the working of single-phase transformer and derive the equation for induced E.M.F E_1 and E_2.	10	KL1	**CO3**
16.	Transform the given magnetic circuit into analogous electrical circuit and calculate the flux produced in the air gap in the magnetic circuit shown in Fig. 4, which is excited by the MMF of	12	KL3	**CO3**

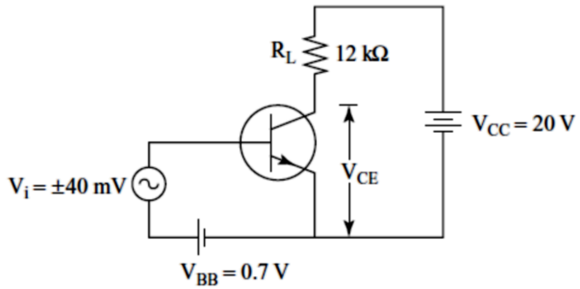
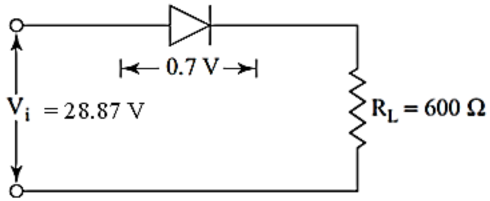
	two windings. The mean length of the flux path is 40 cm. The permeability of iron is 2000. The uniform core cross-sectional area is 10 cm^2. 			
17.	A magnetic circuit has a core of mean length 50 cm, cross-sectional area 4 cm^2, and permeability of 5×10^{-3} H/m. If the coil wound around the core has 200 turns and carries a current of 2A, calculate the magnetic flux produced in the core.	12	KL3	**CO3**
18.	Explain efficiency in a transformer. If a transformer has an input power of 2kW and an efficiency of 95%, calculate the output power.	10	KL1	**CO3**
19.	Compare the working principles of single-phase and three-phase induction motors. What are the advantages of using a three-phase motor over a single-phase motor?	10	KL2	**CO3**
20.	Distinguish between a step-up transformer and a step-down transformer.	10	KL2	**CO3**
21.	Write the expression for the induced emf and torque of a dc machine using standard symbols.	10	KL1	**CO3**
22.	In the given circuit derive the expression for the resonant frequency and the impedance at resonance. Also draw the phasor diagram of the resultant voltage and current. 	10	KL3	**CO3**

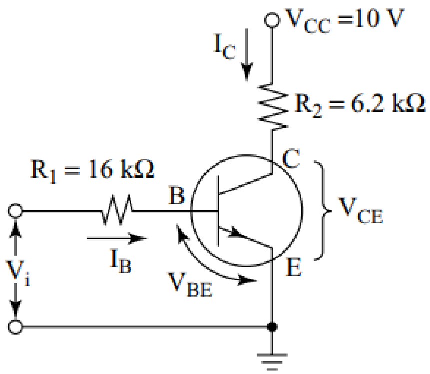
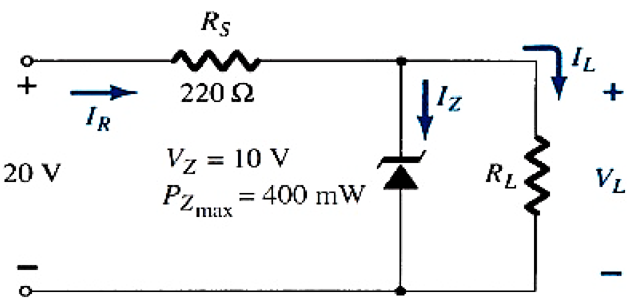
23.	Draw a next sketch of a DC machine and name the component parts.	10	KL1	**CO3**
24.	Explain working and basic principle of operation of a transformer. Gives the classification of single-phase transformers.	10	KL1	**CO3**
25.	An iron ring of mean length of an iron path of 100 cm and having a uniform cross-sectional area of 10 cm2 is wound with two magnetizing coils as shown. The direction of current flowing through the two coils are such that they produce flux in the opposite directions. The permeability of iron is 2000. There is a cut in the ring creating an air gap of 1 mm. Calculate the flux available in the air gap. 	10	KL3	**CO3**
26.	In a series R-L-C circuit, the following values are known. V = 230 v, f = 50 Hz, L = 20mH, R = 20Ω, C = 0.01μF. Find impedance Z, Current I, power factor and Power consumed P.	10	KL3	**CO3**
27.	Explain the principles and working of induction motor with a neat sketch. Distinguish between AC and DC motor.	10	KL2	**CO3**
28.	Examine the function of brush and commutator in a dc machine for generating action.	10	KL1	**CO3**
29.	A rectangular shape iron core has an air gap of 0.01 cm. The mean length of the flux path through iron is 39.99 cm. The relative permeability of iron is 2000. The coil has 1000 turns. The cross-sectional area of the core is 9 cm2. Calculate the current required to produce a flux of 1 mWb in the core as shown in Figure.	10	**KL3**	**CO3**

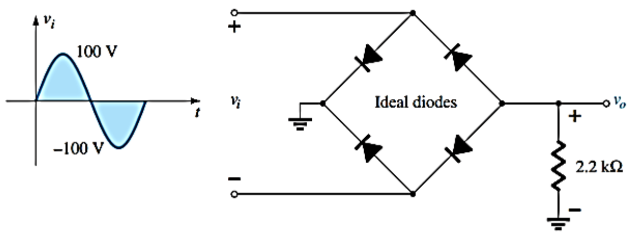
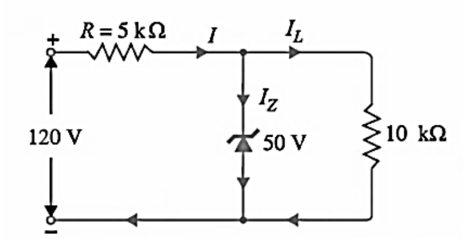
				
30.	Two coils having 80 and 350 turns respectively are wound side by side on a closed iron circuit of mean length 2.5 m with a cross-sectional area of 200cm. Calculate the mutual inductance between the coils. Consider relative permeability of iron as 2700.	5	**KL3**	**CO3**
31.	Determine the inductance L of a coil of 500 turns wound on an air cored toroidal ring having a mean diameter of 300 mm. The ring has a circular cross section of diameter 50 mm.	5	**KL3**	**CO3**

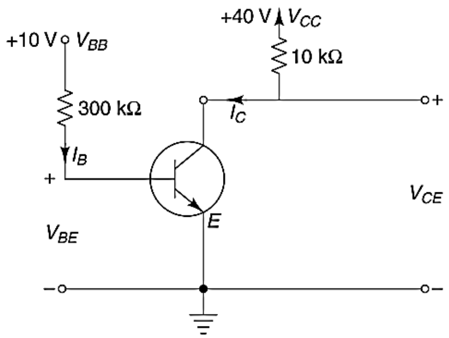
MODULE -4

SL.NO	QUESTIONS	MARKS	KNOWLEDGE LEVEL	COURSE OUTCOME
1.	A half-wave rectifier circuit has been made using a step-down transformer of turn ratio 10:1. The input voltage is $v = 325 \sin \omega t$ the diode forward resistance is 25 Ω. A load resistance of 1.2 kW has been connected in the circuit. Assuming a secondary winding resistance of the transformer as 1Ω, calculate the following: (a) rms value of load current (b) rectification efficiency, and (c) ripple factor.	10	KL3	**CO4**
2.	In an n–p–n transistor in the common emitter configuration, an ac input signal of ± 40 mV is applied. The dc current gain and ac current gain are given as 80 and 100, respectively. Calculate the voltage amplification of the amplifier. The I_B versus V_{BE} characteristic is such that for V_B = 0.7 V, I_B = 12 mA and for V_i = ± 40 mV, I_b = ±4 mA. Also calculate the dc collector voltage.	12	KL3	**CO4**

				
3.	A half-wave diode rectifier has a forward voltage drop, i.e., voltage drop across the diode when conducting is 0.7 V. The load resistance is 600 Ω. The rms value of the ac input is 28.87 V. Calculate I_{dc}, I, peak inverse voltage, and form factor. 	10	KL3	**CO4**
4.	Describe how a MOSFET controls current flow between the drain and source terminals using the voltage applied at the gate terminal. Include both N-channel and P-channel MOSFETs in your discussion.	10	KL2	**CO4**
5.	Explain the working principle of a Zener diode with a neat sketch of a typical circuit and its VI characteristic. Identify and explain the different regions in the characteristic graph.	10	KL1	**CO4**
6.	What minimum input voltage level is required to switch a BJT into saturation (on state) when V_{CC} = 10 V, R_1 = 16 kΩ, R_2 = 6.2 kΩ and β_{dc} = 20 in an n–p–n CE configuration BJT.	12	KL3	**CO4**

				
7.	The input to a bridge rectifier is through a step-down transformer of turn ratio 10:1. The supply voltage is 230 V at 50 Hz. The load resistance is 1.2 kΩ secondary winding resistance of the transformer is 4 Ω diode forward resistance is 2 Ω. Calculate the efficiency of the bridge rectifier.	10	KL3	**CO4**
8.	With the help of a neat sketch, explain construction and operation of NPN BJT.	10	KL1	**CO4**
9.	Determine V_L, I_L, I_Z, and I_R for the network of given Figure. If R_L = 470 Ω. 	10	KL3	**CO4**
10.	Discuss the working of Half Wave rectifier with diagram and graphs as required. The input to a bridge rectifier is through a step-down transformer of turn ratio 10:1. The supply voltage is 230 V at 50 Hz. The load resistance is 1.2 kΩ secondary winding resistance of the transformer is 4 Ω diode forward resistance is 2 Ω. Calculate the following: a) DC Power output of the rectifier b) AC power input	10	KL3	**CO4**

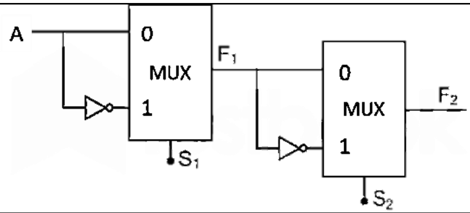
	c) Efficiency of the bridge rectifier.			
11.	With respect to NPN Bipolar Junction Transistor, answer the following questions: i) Discuss the working of NPN Bipolar Junction Transistor in Common Base Mode with diagram. ii) Discuss the working of Bipolar Junction Transistor as an amplifier with diagram. (NPN or PNP, any one may be used to explain) iii) Discuss the working of Bipolar Junction Transistor as a switch with diagram. (NPN or PNP, any one may be used to explain)	10	KL2	**CO4**
12.	Determine the output waveform (V_0) in the network shown in Figure and calculate the output D.C level and required PIV of each diode?  	10	KL3	**CO4**
13.	For the circuit shown in Figure, Determine, (i) the output voltage (ii) the voltage drops across series resistance (iii) the current through Zener diode.  	10	KL3	**CO4**
14.	Explain the operation of PN junction diode. Draw the V-I characteristics of PN junction diode.	10	KL1	**CO4**

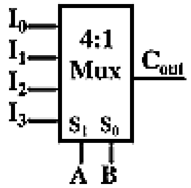
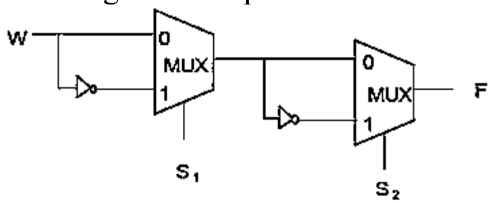
15.	Determine the collector emitter voltage of a transistor shown in Figure operating in CE mode. Assume β = 100 and base emitter voltage is 1 V.  	10	KL3	**CO4**
16.	Discuss the working of an n-MOSFET both as depletion MOSFET and enhancement MOSFET with neat and clean diagram.	10	KL1	**CO4**
17.	A full-wave rectifier has a transformer with a secondary voltage of 24V (rms). The load resistance is 500Ω. Calculate: 1)The peak load voltage. 2) The DC load current. 3) The ripple factor.	10	KL3	**CO4**
18.	Show the three types of transistor configurations. Explain the input and output characteristics of BJT in common emitter configuration with the help of a neat sketch.	10	KL1	**CO4**
19.	Why the gate to source voltage is not used in an N Channel Depletion type MOSFET? What is pinch –off voltage and what happens to the drain to source current at this pinch –off voltage and what is to be done to increase the value of the drain to source current once if it reaches its saturation value? Explain the working of N Channel Depletion type MOSFET with the help of a neat sketch.	10	KL1	**CO4**
20.	Explain the half and full wave rectifier with wave form and also derive the expression for the efficiency in both half and wave rectifier circuit.	10	KL1	**CO4**
21.	Explain the common emitter configuration in BJT and also explain its input and output characteristics with diagram.	10	KL1	**CO4**
22.	Describe how current flows through the different regions of a BJT (emitter, base, and collector) in both NPN and PNP configuration.	10	KL1	**CO4**

23.	Describe how a MOSFET controls current flow between the drain and source terminals using the voltage applied at the gate terminal. Include both N-channel and P-channel MOSFETs in your discussion	10	KL2	**CO4**
24.	Differentiate between ordinary Diode, Avalanche Diode and Zener Diode by taking help of I-V curve and doping profile. Which diode is suitable for switching and voltage regulator circuits.	10	KL2	**CO4**
25.	Draw the circuit diagram of a full-wave rectifier and explain its detailed working. Also, give the input and output neat and clean waveforms.	10	KL1	**CO4**
26.	Illustrate the working of BJT in CE configuration with its characteristics.	10	KL1	**CO4**
27.	Illustrate the working of Zener diode with neat diagram and explain its V-I Characteristics.	10	KL1	**CO4**
28.	Construct a depletion mode MOSFET and explain its working with its characteristics.	10	KL1	**CO4**
29.	Explain the half and full wave rectifier with wave form and also derive the expression for the efficiency in both half and wave rectifier circuit.	10	KL1	**CO4**
30.	Show the three types of transistor configurations. Explain the input and output characteristics of BJT in common emitter configuration with the help of a neat sketch.	10	KL1	**CO4**
31.	Why the gate to source voltage is not used in an N Channel Depletion type MOSFET? What is pinch –off voltage and what happens to the drain to source current at this pinch –off voltage and what is to be done to increase the value of the drain to source current once if it reaches its saturation value? Explain the working of N Channel Depletion type MOSFET with the help of a neat sketch.	10	KL1	**CO4**
32.				

MODULE -5

SL.NO	QUESTIONS	MARKS	KNOWLEDGE LEVEL	COURSE OUTCOME
1.	Explain 8:1 MUX with a neat sketch of its block diagram, logic circuit diagram, truth table, and Boolean expression. Find the output F_2.	10	KL3	**CO5**

				
2.	Explain a common-cathode type BCD to 7-segment decoder with a neat sketch and its truth table.	10	KL3	**CO5**
3.	Explain JK flip-flop with its block diagram and logic circuit diagram, truth table, characteristic table, excitation table, and its Boolean expression.	10	KL3	**CO5**
4.	Implement a Boolean function F (A, B, C) = Σ (1, 3, 5, 7) using an 8:1 and 4: 1 multiplexer respectively.	10	KL3	**CO5**
5.	Implement $f(a, b, c) = \Sigma(0,1,4,6,7)$ using 4:1 MUX.	10	KL3	**CO5**
6.	Explain a full-subtractor arithmetic circuit with a neat sketch of the logic circuit diagram, truth table, and its Boolean expression	10	KL1	**CO5**
7.	Explain FULL Adder in the following points (a) TRUTH TABLE (b) Logic diagram (c) Expression for SUM and CARRY	10	KL1	**CO5**
8.	Explain 3×8 Decoder in the following points (a) TRUTH TABLE (b) Logic circuit diagram using basic gates (c) Expression of output	10	KL2	**CO5**
9.	A 4:1 multiplexer is to be used for generating the output carry of a full adder. A and B are the bits to be added while Cin is the input carry and Cout is the output carry. A and B are to be used as the select bits with A being the more significant select bit. What is the choice of signals to be connected to the inputs I_0, I_1, I_2 and I_3 so that the output is Cout?	10	KL4	**CO5**

				
10.	Design a full-subtractor circuit with three inputs x, y, B_{in} and two outputs Diff and B_{out}.The circuit subtracts x - y - B_{in}, where B_{in} is the input borrow, Bout is the output borrow,and Diff is the difference.	10	KL2	**CO5**
11.	Implement f (x, y, z) = $\sum$ (0, 1, 4, 6, 7) using 4:1 multiplexer.	10	KL3	**CO5**
12.	1. Design the following Multiplexers: i) Design 8:1 MUX using 4:1 mux and other low order MUX or logic gates. ii) Design 4:1 Mux using 2:1 Mux and other logic gates as required.	10	KL3	**CO5**
13.	The alarm system of the car is ON, when any one or more of the following events is true: Any door of the car is open, speed is high beyond a certain level, fuel is low. Consider each of these events stated in its form as logic “1” and the opposite as logic “0”. i) Write the truth table ii) Find the minimized Boolean equation for this system. Show all steps. iii) Draw the logic diagram for this digital system. State all your assumptions if any.	10	KL4	**CO5**
14.	In the circuit given Figure, determine the expression of Boolean Function F in terms of W, S_1, S_2. Realize the same Function using 8:1 multiplexer 	10	KL4	**CO5**
15.	Draw the Circuit of J-K Flip Flop using NAND gate and determine i. Truth table ii. Excitation Table	10	KL2	**CO5**

	iii. Characteristic equation			
16.	Simplify the following Boolean expression A) $Y = \overline{A}C[\overline{\overline{A}BD}] + \overline{A}B\overline{CD} + A\overline{B}C$ B) $\overline{A}BC + A\overline{B}\overline{C} + \overline{A}\overline{B}\overline{C} + A\overline{B}C + ABC$	10	KL4	**CO5**
17.	Describe decoder with the help of one example.	10	KL1	**CO5**
18.	Explain RS and JK flip-flop with neat and clean diagram.	10	KL1	**CO5**
19.	Draw the logic circuit for the given Boolean expression as mentioned in this question and also write the truth table. $Y = AC + BC$ Also realize this expression with the use of either NAND gates or NOR gates.	10	KL3	**CO5**
20.	What is the difference between a flip-flop and a latch? What is an indeterminate condition in an $S\,R$ flip-flop? Draw the truth table, characteristic table, and excitation table for the $S\,R$ flip-flop	10	KL2	**CO5**
21.	Design a JK flip-flop using NAND gates. Explain its characteristic equation and its operation in different modes. Also, describe the concept of race-around condition in a JK flip-flop. How can it be eliminated?	10	KL3	**CO5**
22.	Explain the SR and JK flip flop. Also make truth table, characteristics table and excitation table for both the flip flop.	10	KL1	**CO5**
23.	Explain full adder and also explain how we will made full adder by using two half adder and one OR gate.	10	KL1	**CO5**
24.	Simplify the Boolean expression using K-map and implement using NOR gate F(A, B,C,D) = $\prod$M(0, 4, 6, 7, 8, 12, 13, 14, 15).	10	KL3	**CO5**
25.	Extrapolate the JK flip flop with logic diagram, truth table, characteristic table with expression, excitation table with expression, and timing diagram. How does it set 'eliminate' (race around condition) in a Master –slave J-K flip-flop ensures a stable output.	10	KL2	**CO5**
26.	Design a sequential circuit with two D Flip-Flops, A and B, and one input x. When x = 0, then the state of the circuit remains the same. When x =1, the circuit goes through the state transitions from 00 to 01 to 11 to 10 back to 00, and repeats.	10	KL3	**CO5**

27.	Implement the function f (A, B, C) = Σ m (0, 1, 3, 4, 6, 7) by using a 3-to-8 binary decoder and an OR gate.	10	KL3	**CO5**
28.	Explain full adder and also explain how we will made full adder by using two half adder and one OR gate.	10	KL1	**CO5**
29.	Convert the following SOP expression into canonical form (AB'+BC'+ABC'+A'C)	10	KL3	**CO5**