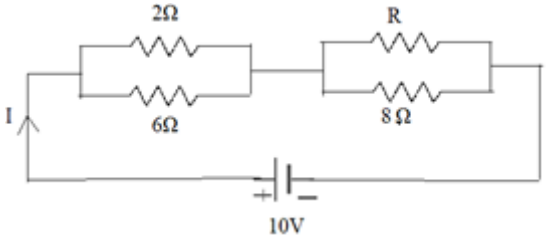
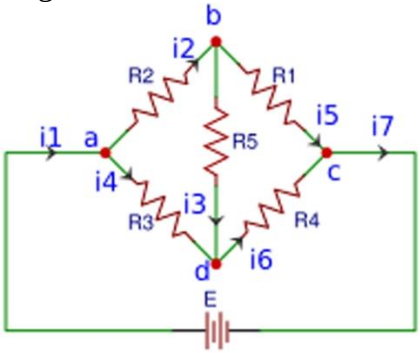
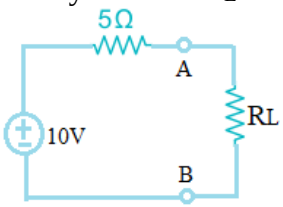
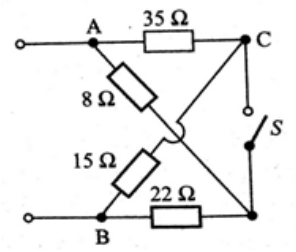
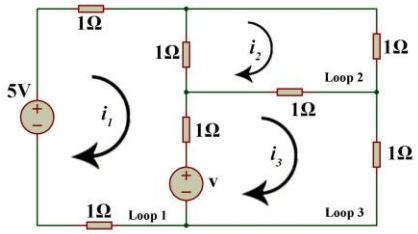
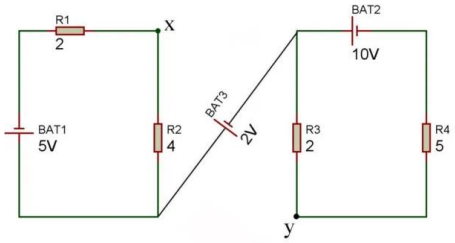
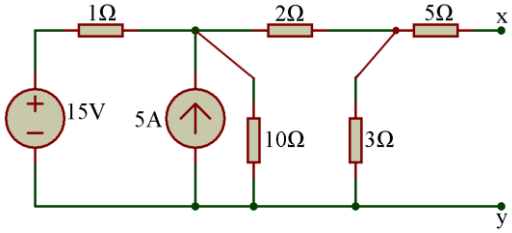
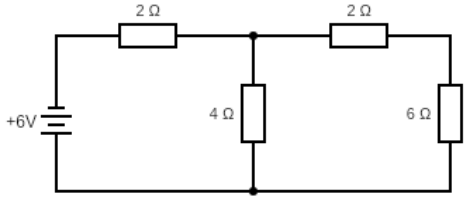
DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

Date	19.01.2023	Maximum Marks	10 +50
Course Code	21ES14D	Duration	110 Mins
Sem	1st Semester	CIE-I	

Basics of Electrical Engineering

Q.No	Part A – Quiz Questions	Marks	COs	BT
1.	The total power consumed by the network shown below is 15W. Find (i) the value of R (ii) the total current I and the voltage across R. 	2	1	1
2.	In the figure given below, find the magnitude and direction of the unknown currents using KCL. Given i_1 = 10A, i_2 = 6A, i_5 = 4A. 	1	1	1
3.	A current of 20A flows through two ammeters A and B connected in series. Across A the potential difference is 0.2 V and across B it is 0.3 V. Find how the same will be divided between A and B when they are connected in parallel.	2	1	2
4.	Draw the network showing each element for the following mesh equations. $3i_1-2i_2 - i_3= 5$ $-2i_1+5i_2 -3i_3= -10$ $- i_1-3i_2 +8i_3= 0$	1	2	2
5.	Thevenin resistance is found by _____ and _____.	1	1	1

6.	The Maximum Power drawn by the load R_L in the above Circuit will be? 	1	2	2
7.	A 50Hz sinusoidal current has peak factor 1.4 and form factor 1.1. Its average value is 20A. The instantaneous value of current is 15A at t=0. Write the equation of current.	1	2	2
8.	A sine wave has frequency of 50Hz. Its angular frequency is ____ radian per second.	1	1	1

Q.No	PART – B Test Questions	Marks	COs	BT
1. a)	In the circuit shown below, determine V_{AB} and voltage across 8 ohms resistor such that voltage drop across 15 ohms resistor is 45V, when switch S is open. 	5	1	2
b)	Find v by mesh method such that the current through the 5V source is zero. 	5	2	2
2. a)	A Piece of Silver wire has a resistance of 1 ohm. Wat will be the resistance of a manganin wire half the length and half the diameter, if the specific resistance of manganin is 30 times that of silver?	5	1	2
b)	In figure given below, find voltage drop across x-y terminals. 	5	2	2
3. a)	What resistance should be connected across x-y in the circuit shown in figure below such that maximum power is developed across this load resistance? What is the amount of this maximum power? 	5	3	3
b)	Calculate the current through the resistor of resistance 6 Ω by Thevenin's Theorem. 	5	3	3

4. a)	An alternating current varying sinusoidally has an RMS value of 20A, 50Hz Frequency. Write the i. instantaneous value equation ii. current 2.5ms and 12.5ms after passing through first positive maximum value. At what time will the instantaneous value be 14.14A measured from first positive maximum.	5	3	3
b)	Derive an expression for Effective value and Average Value of an alternating quantity.	5	3	3
5. a)	Prove that Power consumed by an ideal Inductor is zero and derive the phase relation between voltage and current in an ideal inductor with appropriate waveforms.	5	2	2
b)	Prove that Maximum Power Transferred to the load is $P_{max} = V_g^2/4R_L$.	5	3	3

Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	17	18	25	-	5	30	25	-	-	-

****

Academic year 2022-2023 (ODD Sem)

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

Date	23 Feb 2023	Maximum Marks	10 +50
Course Code	22ES14D	Duration	110 Mins
Sem	I Semester	CIE-II	
Basics of Electrical Engineering			

Q.No	Part A – Quiz Questions	Marks	COs	BT
1.	Define apparent power, active power and reactive power.	2	1	1
2.	In a three phase power measurement by two watt-meter method, the power factor of the load is unity then the readings of the watt-meters are _____	1	2	2
3.	A single-phase load of 30 kW at 0.6 power factor lagging is fed from 200 V A.C. supply. Calculate the kVA and kVAr of the load.	2	2	2
4.	The readings of two wattmeters in a balanced three-phase load are 836W and 224W, the latter reading taken after the current coil connection reversal. Calculate the power consumed by the load and the load power factor.	2	3	2
5.	A 25 kVA transformer has 500 turns on the primary and 40 turns on the secondary windings. The Primary winding is connected to a 3 kV, 50 Hz ac source. The maximum flux in the core is _____.	1	3	2
6.	If the active and apparent powers of an A.C. circuit are equal in magnitude, the power factor is _____.	1	2	2
7.	Three equal impedances are first connected in Delta across a 3-phase balanced supply. If the same impedances are connected in Star across the same supply, then the power consumed will be _____.	1	3	2

Q.No	Part B – Test Questions	Marks	COs	BT
1a.	What is an impedance triangle? Draw the impedance triangle for a series *RL* circuit and series *RC* circuit.	05	2	2
1b.	A resistance of 12 Ω, an inductance of 0.15 H and a capacitance of 130 μF are connected in series across a 100 V, 50 Hz supply. Calculate the impedance, current, phase angle and the power factor.	05	2	2
2a.	Derive an expression for the resonant frequency of a series RLC a.c. circuit. A coil having a resistance of 5 Ω and an inductance of 0.1 H is connected in series with a 50 μF capacitor across a 200 V, variable frequency supply. Determine the frequency at which the current will be a maximum.	05	3	3

Academic year 2022-2023 (ODD Sem)

2b.	A coil having a resistance of 15 Ω and Inductance of 0.2 H is connected in series with another coil having a resistance of 25 Ω and Inductance of 0.04 H to a 230V, 50 Hz Supply. Determine, i. The voltage across each coil ii. The power dissipated in each coil **iii.** The power factor of the whole circuit.	05	3	3
3a.	With the aid of a phasor diagram, obtain the relationship between the line and phase voltages of a three-phase star-connected System.	05	3	3
3b.	A delta-connected load draws a current of 15 A at a lagging power factor of 0.85 from a 400 V, 3-phase, 50 Hz supply. Find the resistance and inductance of each phase.	05	3	2
4a.	With appropriate phasors, show that only two wattmeters are sufficient to measure power in a three-phase star-connected balanced load.	05	3	3
4b.	Each of the two-wattmeter connected to measure the input to a 3-phase circuit reads 10kW on a balanced load when the power factor is unity. What does each instrument read when the power factor falls to i. 0.866 lagging ii. 0.5 lagging, The total 3-phase power remaining unchanged.	05	3	3
5a.	State the differences between a core-type and a shell-type transformer.	05	2	2
5b.	A Transformer installed in commercial complex has following specifications: 1100/230V, 50Hz, single-phase step-down transformer. The net cross sectional area =50 sq.cms. The maximum flux density in the core =1Tesla. Design the number of primary and secondary turns for the above specifications.	05	2	2

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	2	24	34	-	2	33	25			

****

Academic year 2022-2023 (ODD Sem)

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

Q.No	Part A – Quiz Questions	Marks	COs	BT
Date	21 Mar 2023	Maximum Marks	10 +50	
Course Code	22ES14D	Duration	110 Mins	
Sem	I Semester	IMPROVEMENT CIE		
Basics of Electrical Engineering				
1.	The core of a transformer is assembled with laminated sheets so as to reduce _____.	1	3	1
2.	The copper loss of certain transformer at half full-load is measured as 200 W. Then the iron loss and copper loss at full load will be _____ and _____ respectively.	2	3	2
3.	What is the voltage regulation of a transformer?	1	2	1
4.	The speed of a 50 Hz, three-phase induction motor under full-load condition is 720 rpm. The number of pole in the motor is _____.	2	2	1
5.	What is 'slip' in an induction motor?	1	2	1
6.	Draw the torque slip curve for a three-phase induction motor.	1	4	2
7.	A supply of 50 Hz is given to a 3 phase induction motor having 4 poles. If the induction motor runs at 1440 rpm, the slip is _____.	2	4	2

Q.No	Part B – Test Questions	Marks	COs	BT
1a.	Derive the condition for maximum efficiency of a transformer.	4	3	3
1b.	A 10 kVA, 400/200 V, 50 Hz, single phase transformer has a full load copper loss of 200 W and has a full-load efficiency of 96% at 0.8 p.f. lagging. Determine the iron loss. What would be the efficiency at half of the full load and unity p.f.?	6	3	3
2a.	Explain the different losses present in the transformer.	4	2	3
2b.	A 10 kVA, 400/200 V, single phase transformer has a maximum efficiency of 98 % at 90 % of the full load at 0.8 p.f. Find its efficiency at full load and 0.6 p.f.	6	3	3
3a.	Justify the Following: (i) DC supply should not be given to the transformers. (ii) The rotor slots in a three-phase induction motor are purposely given a slight skew.	5	4	3
3b.	A 600 kVA transformer has an efficiency of 92 % at full-load, unity p.f. and half full load, 0.9 p.f. Determine its efficiency at 75 % of full load and 0.9 p.f?	5	3	3

Academic year 2022-2023 (ODD Sem)

4a.	Explain the principle of operation of a three phase induction motors?	5	3	3
4b.	A 4 pole, 50 Hz induction motor has a slip of 1% at no load. When operated at full load, the slip is 2.5%. Find the change in speed from no load to full load.	5	4	3
5a.	Elaborate the phenomenon of production of rotating field by a three-phase supply.	5	2	3
5b.	A 3-phase, 12-pole alternator is driven by an engine running at 500 rpm. The alternator supplies an induction motor which has a full-load speed of 1455 rpm. Find the slip and the number of poles of the motor.	5	4	3

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Test	Max Marks	-	13	29	18	5	5	50	-	-	-

****

22ES14D

USN | | | | | | | | | | |

RV COLLEGE OF ENGINEERING®

(An Autonomous Institution affiliated to VTU)

I Semester B. E. Examinations May-2023

Common to AI / AS/ BT / CH / CS / CY / CD / EC/EI/ET/ IM / IS / ME / CV

BASICS OF ELECTRICAL ENGINEERING (ELECTIVE)

Time: 03 Hours *Maximum Marks: 100*

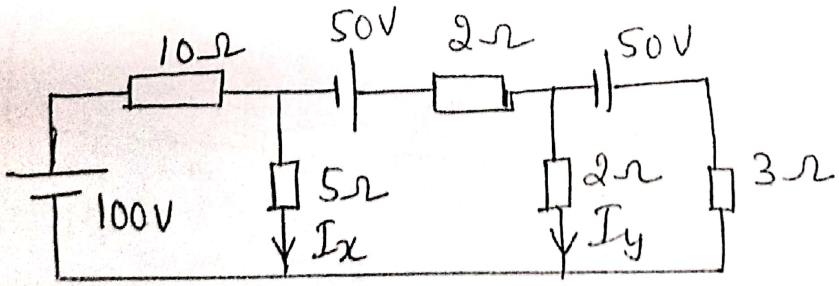
Instructions to candidates:

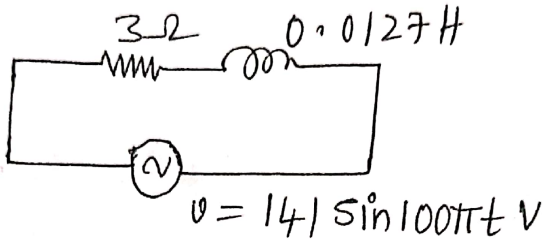
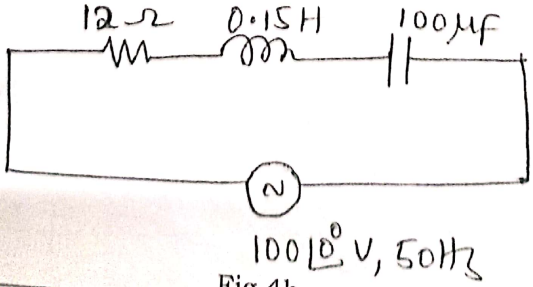
1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. Question number 2 is compulsory. Choose any one full question from 3 or 4, 5 or 6, 7 or 8 and 9 or 10.

PART-A

1	1.1	Define Kirchhoff's laws with illustrative example.	02
	1.2	A heater is given a current of $10A$ from a $250V$ source for $15hours$. Determine the energy consumed by the heater in kWh.	02
	1.3	Define RMS and average value.	02
	1.4	A series circuit with $R = 10\Omega$, $L = 50mH$ and $C = 100\mu F$ is supplied with $200V, 50Hz$. Find impedance value in the circuit.	02
	1.5	Write the relation between phase and line values of voltage and currents in star and delta connected loads.	02
	1.6	Define efficiency and regulation of a transformer.	02
	1.7	A $3-$phase, $4-$pole, $400V, 50H$. Induction motor runs with a speed of $1440rpm$. Calculate its slip.	02
	1.8	List the types of single-phase induction motor.	02
	1.9	Define fuse and miniature circuit breaker.	02
	1.10	Write any four safety precaution to avoid electric shock.	02

PART-B

2	a	State and prove Thevenin's theorem.	08
	b	Using KCL and KVL, determine the currents I_x and I_y in the network shown in Fig 2b.  Fig 2b	08
3	a	Show that the power consumed in an RC series circuit is $VI\cos\phi$. Draw the waveform for voltage, current and power.	06

	b	Define: i) Instantaneous value ii) Amplitude iii) Cycle iv) Period With respect to sinusoidally varying quantities.	
	c	For the series RL circuit shown in Fig 3c, i) Calculate rms value of current and its angle ii) Expression for current iii) Average power dissipated in the circuit iv) Determine pf v) Draw the phasor diagram.  Fig 3c	06
		OR	
4	a	An alternating current of frequency $60Hz$ has a maximum value of $12A$. i) Write down the equation for its instantaneous value. ii) Find the value of current after $\frac{1}{360} seconds$ iii) Find the time taken to reach $9.6A$ for the first time.	06
	b	For the circuit shown in Fig 4b, calculate i) The impedance ii) The current iii) Phase angle iv) Voltage across each element v) Power factor vi) Apparent power vii) The average power. Also, draw the phasor diagram for the circuit.  Fig 4b	
5	a	Obtain the relationship between line current and phase current in a balanced 3ϕ delta connected system.	10
	b	What are the advantages of 3ϕ systems over a single phase system?	06 04

	c	Two-wattmeter method was used to determine the input power to 3ϕ motor. The reading were $5.2kW$ and $-1.7kW$ and the line voltage was $415V$. Calculate: i) Total power ii) Power factor iii) Line current.	06
		OR	
6	a	Explain the principle of operation of a single phase transformer and derive its EMF equation.	08
	b	A $600kVA$ transformer has an efficiency of 92% both at full load unity pf and half load $0.9pf$. Determine its efficiency at 75% of full load and $0.9pf$.	08
7	a	Describe the constructional differences between a squirrel cage rotor and wound rotor of an induction motor. Discuss their relative advantages and disadvantages.	06
	b	Define slip. Derive an expression for the slip and frequency of the rotor current.	05
	c	A 6 –pole induction motor is supplied by a 10 –pole alternator which is driven at $600rpm$. If the motor is running at $970rpm$, determine the percentage slip.	05
		OR	
8	a	Explain the concept of rotating magnetic field of an induction motor.	10
	b	Explain and draw torque-slip characteristics of a 3ϕ induction motor.	06
		Describe the construction of a single phase induction motor with the aid of diagram.	
9	a	With the help of a block diagram, explain the concept of power transmission and power distribution.	08
	b	Explain with an example, how the electricity bill be generated for domestic consumers.	08
		OR	
10	a	Explain the working principle of fuse and MCB and also explain the merits and demerits of each one.	06
	b	What is earthing and explain with diagram pipe earthing.	06
	c	What are the safety precautions to be taken to avoid electric shock?	04