CBCS SCHEME

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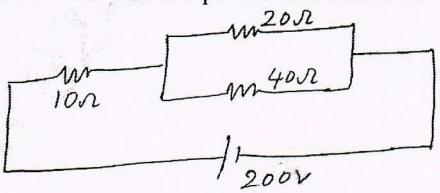
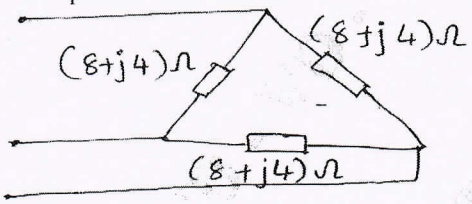
BEEE103/203

First/Second Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024
Elements of Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	State and explain Kirchoff's laws with an example.	6	L2	CO1
	b.	In the given Fig.Q.1(b). Find the current in each resistance and voltage across 10Ω resistance. Find also the power consumed in each resistances.  Fig.Q.1(b)	6	L3	CO1
	c.	i) State and explain Faraday's laws of Electromagnetic induction. ii) Derive the expression for energy stored in inductor.	8	L2	CO1
		OR			
Q.2	a.	Define the co-efficient of coupling and find its relation with L_1, L_2 and M.	7	L2	CO2
	b.	State Ohm's law. Mention its limitations.	6	L1	CO2
	c.	Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that 60% of the flux produced by one coil links the other. If a current of 10A, flowing in the first coil, produces a flux of 0.5mWb, find the inductance of the second coil.	7	L3	CO2
		Module – 2			
Q.3	a.	Derive an expression for power in pure inductance circuit and draw voltage, current and power waveforms.	6	L3	CO2
	b.	A circuit consists of a resistance of 20Ω, an inductance of 0.05H connected in series. A supply of 230V at 50Hz is applied across the circuit. Find the current, power factor and power consumed by the circuit.	6	L3	CO2
	c.	Derive an expression for power in series resistance and inductance circuit and draw voltage, current and power waveforms.	8	L3	CO2
		OR			
Q.4	a.	Show that voltage and current in pure resistive circuit is in phase with each other. Also derive the equation for power consumed.	6	L3	CO2

	b.	An inductive coil takes a current of 33.24A from 230V, 50Hz supply. If the resistance of the coil is 6Ω, calculate the inductance of the coil and the power taken by the coil.	6	L3	CO2
	c.	Two impedances (150 – j157)Ω and (100 + j110)Ω are connected in parallel across 200V, 50Hz supply. Find branch currents, total current and total power consumed by the circuit.	8	L3	CO2
		Module – 3			
Q.5	a.	With a neat circuit diagram and phasor diagram, show that two wattmeters are sufficient to measure 3 phase power.	8	L3	CO2
	b.	Obtain the relationship between line and phase values of voltage and current in a balanced 3 phase delta connected system.	6	L3	CO2
	c.	A delta connected load is arranged as shown in Fig.Q.5(c). The supply voltage is 415V at 50Hz. Calculate: i) The phase currents ii) The live currents iii) The total power in the circuit.  Fig.Q.5(c)	6	L3	CO2
		OR			
Q.6	a.	In a three phase star connection. Find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power.	6	L3	CO1
	b.	What are the advantages of 3 phase system over single phase system?	6	L2	CO3
	c.	Three 100Ω resistors are connected in i) STAR and ii) DELTA across a 415V, 50Hz, 3 phase supply. Calculate the line and phase currents and the power consumed in each case.	8	L3	CO3
		Module – 4			
Q.7	a.	With a neat diagram, explain the construction and working of megger.	6	L2	CO4
	b.	Explain two way and three way control of lamp with the truth table.	8	L2	CO5
	c.	Mention the difference between current transformer and potential transformer.	6	L2	CO4
		OR			
Q.8	a.	Explain the construction and working of Wheat Stone's bridge with necessary diagrams.	6	L2	CO4
	b.	Explain the construction of Maxwell's bridge and derive the expression for unknown inductance.	8	L2	CO4

	c.	Explain the construction and working of Kelvin's double bridge.	6	L2	CO4
		Module – 5			
Q.9	a.	Write a short note on fuse and MCB.	8	L2	CO5
	b.	Explain the working of ELCB with a neat diagram.	6	L2	CO5
	c.	What are the desirable characteristics of tariff and explain two part tariff.	6	L2	CO5
		OR			
Q.10	a.	With a neat diagram, explain the operation of RCCB.	6	L2	CO5
	b.	Explain necessity of earthing with a neat diagram explain pipe earthing.	8	L2	CO5
	c.	Write a short note on precautions against electric shock.	6	L2	CO5

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CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State Kirchoff's laws applied to an electric circuit. **(05 Marks)**

b. Explain the meaning of,
(i) Self-induced voltage.
(ii) Mutually induced voltage and give a practical example of each effect. **(05 Marks)**

c. In the resistance circuit of Fig. Q1 (c), find V_1 and I_2.

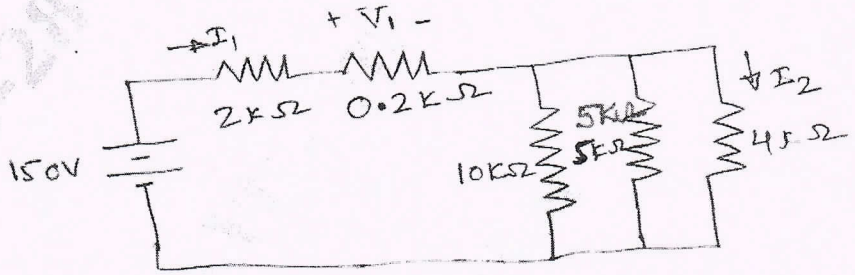

Fig. Q1 (c) **(06 Marks)**

OR

2 a. Deduce an expression for stored energy in a magnetic field. **(05 Marks)**

b. A direct current circuit comprises two resistors, 'A' at value 25 Ω and 'B' of unknown value, connected in parallel together with third resistor 'C' of value 5 Ω connected in series with parallel group. The potential difference across C is found to 90 V. If the total power in the circuit is 4320 W, Calculate :
(i) The value of resistor 'B'.
(ii) The voltage applied to the ends of whole circuit.
(iii) The current in each resistor. **(05 Marks)**

c. Two coils 'A' of 12,500 turns and 'B' of 16000 turns, lie in parallel planes so that 60% of flux produced in A links coil B. It is found that a current of 5A in A produces a flux of 0.6 mwb while the same current in B produces 0.8 mwb. Determine
(i) Mutual inductance and (ii) Coupling co-efficient. **(06 Marks)**

Module-2

3 a. Draw a neat sketch of a d.c. generator. State the functions of main parts. **(06 Marks)**

b. Explain with neat sketch, the construction and working of dynamometer type wattmeter. **(06 Marks)**

c. A 4-pole generator with wave wound armature has 51 slots each having 48 conductors, the flux per pole is 7.5 mwb. At what speed must the armature be driven to give an induced emf of 440 V. **(04 Marks)**

OR

4 a. Derive the torque equation of a D.C. motor. **(05 Marks)**

b. With neat diagram, explain the construction and working of single phase induction type energy motor. **(06 Marks)**

c. Explain the characteristics of series motor. **(05 Marks)**

Module-3

5 a. Explain the following terms applied to alternating current wave :

(i) Maximum value.
(ii) Average value.
(iii) r.m.s value **(05 Marks)**

b. Write a note on :

(i) Precaution against electric shock.
(ii) Three way control of lamp. **(06 Marks)**

c. A 230 V, 50 Hz a.c. supply is applied to a coil of 0.06 H inductance and 2.5 Ω resistance connected in series with a 6.8 μF capacitor. Calculate :

(i) Impedance
(ii) Current
(iii) P.f.
(iv) Power consumed. **(05 Marks)**

OR

6 a. Define and express interms of voltage, current and phase angle :

(i) Abparent power
(ii) Active power
(iii) Reactive power **(04 Marks)**

b. Explain with neat sketch pipe earthing. **(06 Marks)**

c. A 60 Ω resistor connected in parallel with an inductive reactance of 80 Ω to a 240 V, 50 Hz supply. Calculate

(i) The current through the resistor and inductive reactance.
(ii) Supply current.
(iii) The circuit phase angle. **(06 Marks)**

Module-4

7 a. Establish the relation between phase and line values (V & I) of 3-phase Y connected system. Draw relevant vector diagram. **(06 Marks)**

b. List the advantages of rotating field type alternator. **(04 Marks)**

c. Two wattmeters are used to measure power in a 3-phase balanced load. The wattmeter readings are 8.2 kW and 7.5 kW. Calculate

(i) Total active power (ii) p.f. (iii) Total reactive power
(iv) Total apparent power **(06 Marks)**

OR

8 a. Show that two wattmeters are sufficient to measure three phase power. **(05 Marks)**

b. A 3 phase, 6 pole, star connected alternator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 wb. Calculate the voltage generated by the machine if the winding factor is 0.96. **(06 Marks)**

c. 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 Marks)**

Module-5

9 a. Describe the operation of a single-phase transformer, explaining clearly the functions of the main parts. **(06 Marks)**

b. Derive the equation relating rotor frequency and stator frequency of a 3-phase induction motor. **(05 Marks)**

c. A 125 KVA transformer having primary voltage of 2000 V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate (i) The full load primary and secondary currents (ii) The no load secondary induced emf and (iii) The maximum flux in the core. **(05 Marks)**

OR

10 a. Explain the principle of operation of 3-phase induction motor. Show flow rotating magnetic field is established in air gap and rotates at synchronous speed. **(06 Marks)**

b. Write a note on losses occurred in the single phase transformer. **(05 Marks)**

c. A single phase transformer working at unity power factor has an efficiency of 90% at both half load and at the full load of 500 W. Determine the efficiency at 75% full load and the maximum efficiency. **(05 Marks)**

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CBCS SCHEME

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18ELE13/23

First/Second Semester B.E. Degree Examination, Dec.2023/Jan.2024
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. State and explain Ohms' law. What are its limitations? **(07 Marks)**

b. Define RMS value, derive an expression for RMS value of a sinusoidal AC voltage. **(08 Marks)**

c. Two 10 ohms resistors are connected in parallel, which is connected is series with 25 ohms resistance across 90V supply. Find the voltage across 25ohms resistor and the total power consumed by the circuit. **(05 Marks)**

OR

2 a. Explain clearly, how alternating voltage is generated. **(06 Marks)**

b. Two storage batteries A and B are connected in parallel to supply a load of 0.30 ohms. The open circuit emf of A is 11.7 volts and that of B is 12.3 volts. The internal resistances are 0.06 ohms and 0.05 ohms respectively. Find the correct supported to the load. **(08 Marks)**

c. State and explain KCL and KVL. **(06 Marks)**

Module-2

3 a. Derive an expression and show that current lags voltage by an angle "ϕ" for an a.c circuit containing two elements is series. **(07 Marks)**

b. What are the advantages of the three phase system when compared with single phase a.c system? **(04 Marks)**

c. A series circuit with R = 10 ohms, L = 50m Henry and C = 100μ Farady's is supplied with 200V 50Hz. Find : i) Impedance ii) Current iii) Power iv) Power factor. **(09 Marks)**

OR

4 a. Establish the relationship between phase and line values of voltage and currents in a 3-phase delta connected circuit. **(08 Marks)**

b. Derive an expression and show that the average power consumed by a pure capacitor is zero. **(08 Marks)**

c. Two wattmeter connected in a balanced system indicates 4.5kW and 0.5kW, the later wattmeter reading is obtained after reversing its current coil. What is the total power and power factor of the circuit? **(04 Marks)**

Module-3

5 a. Derive emf equation of transformer. **(07 Marks)**

b. With a neat circuit diagram, explain how a single lamp can be controlled from 3 switches. **(07 Marks)**

c. The required no load ration is a single phase, 50Hz core type transformer is 6000/250V. Find the number of turns per limb on the high and low voltage sides if the flux is to be about 0.06wb. **(06 Marks)**

OR

6 a. What is the necessity of earthing? With neat sketch, explain plate earthing. **(08 Marks)**

b. In a 25KVA, 2000/200V, single phase transformer the iron and full load copper losses are 350 and 400W respectively. Calculate the efficiency at unity power factor on full load and half load. **(08 Marks)**

c. What are the losses that occurs is a transformer how they are minimized? **(04 Marks)**

Module-4

7 a. Draw the schematic representation of DC shunt generator, and obtain the relationship between induced emf and terminal voltage. **(06 Marks)**

b. Derive an expression for armature torque in a d.c motor. **(06 Marks)**

c. A 110V, d.c shunt generator delivers an armature current of 52amps, its armature resistance is 0.2 ohms, the generator rotates at a speed of 1800 rpm has 6 poles lap connected and has 360 conductors. Calculate the generated emf and flux per pole. **(08 Marks)**

OR

8 a. Draw the explain the main parts of dc generator. **(06 Marks)**

b. Draw the characteristics of dc server meter and explain. **(06 Marks)**

c. A 230V dc shunt motor takes a no-load current of 2amp, and runs at 1100 rpm. It the full-load current is 40Amps, find the speed at full load. Assume flux remains constant and armature resistance is 0.25 ohms. Neglect field current. **(08 Marks)**

Module-5

9 a. What is the necessity of starter in an indication meter? Explain star – delta starter with a neat figure. **(08 Marks)**

b. Derive the expression for frequency of generated voltage is an alternator. **(04 Marks)**

c. A 3 phase, 50Hz, 16 pole alternator has star connection with 144 slots having 10 conductors/slot. The flux/pole is 24.8m wb. The coils are full pitched. Find : i) Speed and ii) the line emf, take winding factor as 0.96. **(08 Marks)**

OR

10 a. With a neat figure, explain the constructional details of an alternator. **(08 Marks)**

b. Explain the concept of rotating magnetic field of an induction motor. **(08 Marks)**

c. A 3 phase, 6 pole, 60Hz inductor motor has frequency of rotor current at full load of 1.8Hz. Find the synchronous speed and slip of full – load. **(04 Marks)**

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Date : 7/02/2024 Time : 2.00 pm to 5.00 pm 6

Following Highlighted corrections to be made in respective Questions

CBCS SCHEME

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BESCKB204/BESCK204B

Second Semester B.E/B.Tech. Degree Examination, Dec.2023/Jan.2024
Introduction to Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.
3. Use of VTU Hand book is permitted.

		Module – 1	M	L	C
1	c.	A circuit of two parallel resistor having resistance of 15Ω and 25Ω connected in series with 10Ω. If the current through 10Ω resistor is 2A. Find : i) Current in 15Ω and 25Ω resistors ii) Voltage across the whole circuit iii) The total power and power consumed in all resistors.	8	L3	CO2
		Module – 3			
5	c.	An 8 pole generator has 500 armature **conductors** and has a useful **flux** per pole of 0.065Wb, what will be the emf generated if it is lap connected and rms at 1000rpm? What must be the speed at which it is to be driven to produce the same emf it is in wave wound.	6	L1	CO3
		OR			
6	c.	A 6 pole DC shunt motor take 20A from a 220V supply. The armature and field resistances are 0.4 Ω and 110 Ω respectively. The wave wound armature has 30 slots and each slot containing 10 conductors. If the flux per pole is 0.02wb, Calculate : i) Speed ii) torque developed iii) power developed.	8	L3	CO3
		Module – 5			
9	c.	What is the difference between fuse and MCB?	6	L2	CO5
		OR			
10	c.	Explain casing and capping types of wiring with its merits and demerits.	6	L1	CO5

CBCS SCHEME

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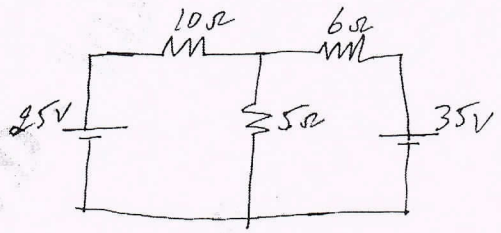
BESCKB204/BESCK204B

Second Semester B.E/B.Tech. Degree Examination, Dec.2023/Jan.2024
Introduction to Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	State the ohm's law and its limitations? Also define KVL and KCL.	6	L1	CO1
	b.	With block diagram explain solar power generations.	6	L1	CO1
	c.	A circuit of two parallel resistor having resistance of 15Ω and 95Ω connected in series with 10Ω. If the current through 10Ω resistor is 2A. Find : i) Current in 15Ω and 25Ω resistors ii) Voltage across the whole circuit iii) The total power and power consumed in all resistors.	8	L3	CO2
		OR			
2	a.	With block diagram, explain nuclear power generations.	6	L1	CO1
	b.	With neat single line diagram explain the various steps of electrical power transmission and distribution system.	6	L1	CO1
	c.	For the circuit shown in Fig.Q2(c). Find the current in 5Ω resistor.  Fig.Q2(c)	8	L3	CO2
		Module – 2			
3	a.	Write a short note on power triangle?	6	L2	CO1
	b.	A series circuit with a resistor of 100ohms, capacitor of 25 microfarad and inductance of 0.15H is connected across 250V, 50Hz supply. Calculate impedance, current, power and power factor of circuit.	8	L3	CO2
	c.	Define the terms : i) RMS value ii) Average value iii) Form factor iv) Peak factor v) Amplitude vi) Frequency.	6	L2	CO2
		OR			
4	a.	Obtain the relationship for STAR connection with circuit diagram.	6	L2	CO2
	b.	Obtain the expression for voltage, current and power with phasor diagram for R – C circuit series.	8	L4	CO2
	c.	Write the advantage of 3 phase power system over single phase power system.	6	L1	CO2

		Module – 3			
5	a.	With neat diagram explain any 5 parts of DC machine.	8	L3	CO3
	b.	Derive torque equation for DC motor.	6	L2	CO3
	c.	An 8 pole generator has 500 armature and cross and has a useful five per pole of 0.65Wb, what will be the emf generated if it is lap connected and rms at 1000rpm? What must be the speed at which it is to be driven to produce the same emf if is in wave mound.	6	L1	CO3
		OR			
6	a.	Explain the various methods used to control the speed of DC motor.	8	L2	CO3
	b.	With usual notation derive an emf equations of DC generator.	4	L1	CO3
	c.	A 6 pole DC shunt motor take 20A form a 220V supply. The armature and field resistances. The wave wound armature has 30 slots and each slot containing 10 conductors. If the flux per pole is 0.02wb, Calculate : i) Speed ii) torque developed iii) power developed.	8	L3	CO3
		Module – 4			
7	a.	A transformer is rated at 100KVA, at full load its copper loss is 1000W and its iron loss is 900W. Calculate : i) The efficiency at fall load UPF ii) Efficiency at half load, 0.8pf iii) The maximum efficiency at 0.85pf.	8	L3	CO3
	b.	With neat diagram explain he types of 3 – phase induction motor.	6	L2	CO3
	c.	Explain the working principle of single phase transformers.	6	L1	CO3
		OR			
8	a.	Explain the various losses in a transformer and how to minimize them.	6	L2	CO4
	b.	With diagram explain the concept of rotation magnetic field.	6	L2	CO4
	c.	A three phase induction motor with 4 poles is supplied form the alternator having 6 poles running at 1000rpm. Calculate synchronous speech, rotor speed of the induction motor when slip is 0.04 and frequency of the rotor emf when the speed is 600rpm.	8	L3	CO4
		Module – 5			
9	a.	Define 'unit' used for consumption of electrical energy and explain the two part tariff with its advantages and disadvantages.	8	L2	CO5
	b.	What is electric shock? Give the lists of preventive measures against the shock?	6	L1	CO5
	c.	What is the difference between fuse and MCTS?	6	L2	CO5
		OR			
10	a.	What is earthing? With neat diagram explain plate earthing.	8	L2	CO5
	b.	With neat circuit diagram and switching table explain two very and three way control of lamp.	6	L2	CO5
	c.	Explain coning and copping types of wiring with its merits and demerits.	6	L1	CO5

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CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2023
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. State and explain Kirchhoff's laws. **(06 Marks)**

b. Derive the expression for Energy stored in magnetic field. **(04 Marks)**

c. Find the value of 'R' if power dissipated in 160 ohm resistor is 36 watts for the circuit shown in Fig. Q1(c). **(06 Marks)**

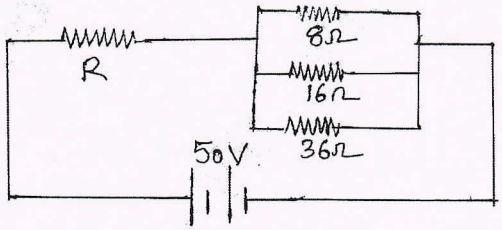

Fig. Q1(c)

OR

2 a. Two coupled coils self inductances 0.8 Henry and 0.2 Henry have a co-efficient of coupling 0.9. Find the mutual inductance and turns ratio. **(05 Marks)**

b. For the circuit shown in Fig. Q2(b), find current through 10V source and 3Ω. **(06 Marks)**

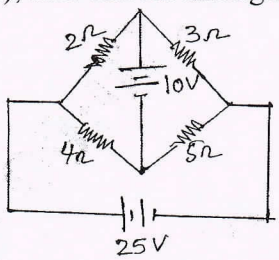

Fig. Q2(b)

c. State and explain Faraday's and Linz laws. **(05 Marks)**

Module-2

3 a. With a neat diagram, explain the construction and working of a d.c. generator. **(06 Marks)**

b. Derive the torque equation of a d.c. motor. **(04 Marks)**

c. A 4 pole DC shunt motor takes 22 Amps from 220V supply. The armature and field resistances are 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors. If flux / pole is 20 milli webers, calculate speed and gross torque. **(06 Marks)**

OR

4 a. With neat diagram, explain the principle of operation of dynamo meter type Wattmeter. **(07 Marks)**

b. An 8 – pole lap connected armature has 40 slots with 12 conductors per slot generates a voltage of 500V. Determine the speed at which it is running if flux / pole is 50 milli weber. **(05 Marks)**

c. Explain the significance of back emf and necessity of a starter for a d.c. motor. **(04 Marks)**

Module-3

5 a. Derive RMs value for a sinusoidal voltage. Also define Form factor. **(05 Marks)**

b. With neat diagram, explain Plate type Earthing. **(04 Marks)**

c. In a series R – L circuit with R = 10Ω and L = 1 Henry, I = 10 Ampere. Find the Power , Power factor of the circuit. Also write equation for voltage in the form V = Vm Sin(wt + θ). Take frequency as 50 Hertz. **(07 Marks)**

OR

6 a. What is Electric Shock and mention precautions to be taken against Electric Shock. **(05 Marks)**

b. Two circuit comprising of i) R = 10Ω in series with inductor of 0.05 Henry.
ii) A pure capacitor of 100μf are connected in parallel across 200V, 50Hz supply. Calculate the Total supply current , Power of circuit. **(07 Marks)**

c. Prove in a R – C series circuit current leads voltage by an angle ϕ. **(04 Marks)**

Module-4

7 a. With a neat circuit diagram, vector diagram, derive the relationship between line and phase current in a 3 – phase delta connected system. **(07 Marks)**

b. Explain with neat diagram, salient and non – salient pole rotors. **(05 Marks)**

c. Each phase of a Three phase star connected circuits consists of R = 10Ω in series with capacitance of 50μ farads. Find the power and power factor of circuit when connected across 400V , 50Hz 3 – phase supply. **(04 Marks)**

OR

8 a. A certain balanced 3 – phase load takes 20 kW at 25 KVA. Find the readings of two watt meters connected to measure power. **(06 Marks)**

b. A Three phase star connected synchronous generator driven at 900 RPM is required to generate a line voltage of 460V at 60Hz on open circuit. The stator has two slots per pole per phase and 4 conductors per slot. Calculate i) Number of poles ii) Useful flux per pole. **(07 Marks)**

c. Derive the expression for frequency of an alternator. **(03 Marks)**

Module-5

9 a. Explain with neat diagram the construction and working of core and shell type transformer. **(06 Marks)**

b. With neat diagram, explain the working of a Star – Delta Starter. **(06 Marks)**

c. A 250 KVA, 11000/415V, 50Hz single phase transformer has 80 turns on secondary. Calculate i) Primary and Secondary currents ii) The maximum value of flux. **(04 Marks)**

OR

10 a. A 12 pole , 3 – phase alternator is coupled to an engine running at 500 RPM. It supplies an induction motor which has a full load speed of 1440 RPM. Find the percentage slip and number of poles of motor. **(04 Marks)**

b. Write the equation for efficiency of an transformer at any load. Also derive the condition for maximum efficiency in a transformer. **(06 Marks)**

c. Describe the construction and working principle Squirrel cage induction motor. **(06 Marks)**

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CBCS SCHEME

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18ELE13/23

First/Second Semester B.E. Degree Examination, June/July 2023
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State and explain Ohm's law, write its limitations. **(06 Marks)**

b. Using Kirchhoff's law, find the potential difference between 'a' and 'b'.

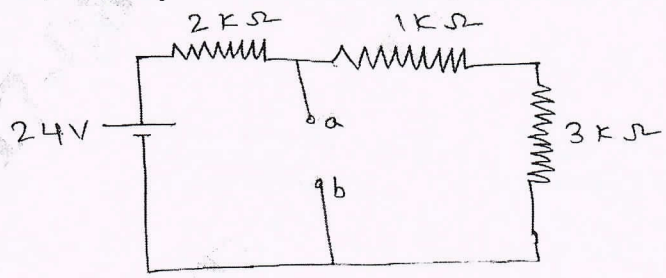

Fig.Q1(b) **(06 Marks)**

c. Define the following:
(i) Amplitude (ii) Time period
(iii) Frequency (iv) Instantaneous value for sinusoidal wave **(08 Marks)**

OR

2 a. Derive an expression for RMS value of sinusoidal current. **(06 Marks)**

b. An alternating current i is given by ; i = 141.4 sin 314t. Find:
(i) Maximum value (ii) Frequency and time period
(iii) RMS value (iv) The instantaneous value when 't' is 3 ms **(06 Marks)**

c. A resistance of 'R' Ω is connected in series with a parallel circuit comprising two resisters of 12 Ω and 8 Ω respectively. The total power dissipated in the circuit is 70 W when the applied voltage is 22 Volts. Calculate value of 'R'. **(08 Marks)**

Module-2

3 a. Show that the average power consumed by pure inductor is zero. Draw the waveforms of current voltage and power. **(08 Marks)**

b. A coil having resistance of 7Ω an inductance of 31.8 mH is connected to 230 V, 50 Hz supply. Calculate: (i) Current (ii) Phase angle (iii) Power factor (iv) Power consumed **(08 Marks)**

c. Define active, reactive and apparent power. **(04 Marks)**

OR

4 a. In three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. **(08 Marks)**

b. A balanced star connected load of (8 + j6)Ω per phase is connected to a three phase, 230 V supply. Find line current, pf and reactive power. **(06 Marks)**

c. A resistance of 20Ω and a coil of inductance 31.8 mH are connected in parallel across 230 V, 50 Hz supply. Find : (i) Current (ii) p.f. (iii) Power consumed by circuit. **(06 Marks)**

Module-3

5 a. Explain construction and working of single phase transformer. **(06 Marks)**

b. With neat sketch, explain plate earthing. **(06 Marks)**

c. In a certain 50 kVA transformer, the number of turns on the primary and secondary windings is 834 and 58 respectively. If primary is connected to a 3300 V supply, find:
(i) Secondary voltage
(ii) The primary and secondary currents
(iii) Maximum flux required if primary voltage is 3300 V and 50 Hz. **(08 Marks)**

OR

6 a. With the truth table, explain controlling lamp by three way control. **(07 Marks)**

b. With neat sketch, write the function of service main, meter board and distribution board. **(06 Marks)**

c. In a 50 KVA transformer the iron loss is 500 Watts and full load copper loss is 800 Watts. Find the efficiency at: (i) Full load UPF (ii) $\frac{1}{2}$ load, 0.8 pf lead **(07 Marks)**

Module-4

7 a. With the neat sketch, explain the construction of D.C. generator. **(07 Marks)**

b. Derive torque equation for D.C. motor. **(06 Marks)**

c. A 6-pole lap-wound d.c. generator has 600 conductors on its armature. The flux per pole is 0.02 Wb. Calculate:
(i) The speed at which the generator must be run to generate 300 V.
(ii) What would be the speed if the generator were wave-wound? **(07 Marks)**

OR

8 a. Explain the characteristics of D.C. series motor. **(06 Marks)**

b. A 30 KW, 300V d.c. shunt generator has armature and field resistance of 0.05Ω and 100 Ω respectively. Calculate the generated voltages if brush drop is 1V/brush. **(07 Marks)**

c. A d.c. motor taxes an armature current of 110 A at 480 V. The armature resistance is 0.2 Ω. The machine has 6-poles and the armature is lap connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate the gross torque developed by the motor. **(07 Marks)**

Module-5

9 a. With neat sketch, explain the construction of three phase synchronous generator. **(07 Marks)**

b. 500 H.P, 3-phase, 440 V, 50 Hz induction motor has a speed of 950 rpm on full load. The machine has 6-poles. Calculate full load slip. Also find rotor frequency. **(06 Marks)**

c. A 3-phase, 50 Hz, star connected alternator (synchronous generator) has 180 conductors per phase and flux per pole is 0.0543 Wb. Find e.m.f. generated per phase and line if $K_c = 1$ and $K_d = 0.96$. **(07 Marks)**

OR

10 a. Explain, how a rotating magnetic field generated in 3-phase induction motor. **(07 Marks)**

b. Derive e.m.f. equation of three phase synchronous generator. **(07 Marks)**

c. A 6-pole alternator running at 1000 rpm supplied on 8-pole induction motor. Find the actual speed of the motor if the slip is 2.5%. **(06 Marks)**

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CBCS SCHEME

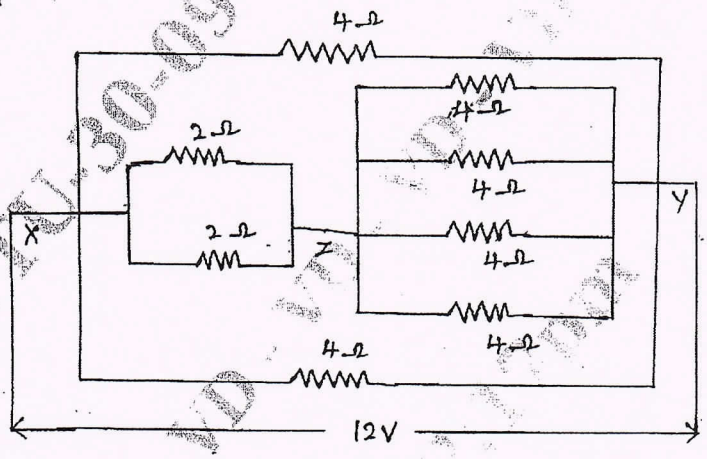
USN | | | | | | | | | | |

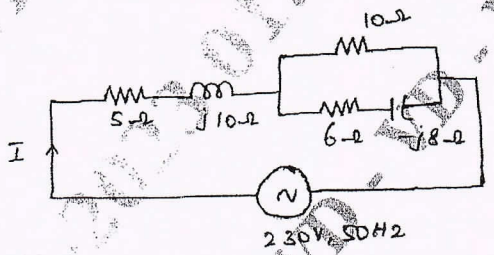
BEEE103/203

First/Second Semester B.E./B.Tech.Degree Examination, June/July 2023
Elements of Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	State and explain Kirchoff's laws.	6	L2	CO1
	b.	Find the total resistance of the circuit across the terminals X and Y. Also find the power consumed by the circuit if a 12 V battery is connected across XY.  Fig. Q1(b)	6	L2	CO1
	c.	Brief about, (i) Magnetic Flux (ii) Magnetic Flux Density (iii) Magneto motive force (iv) Magnetic flux density	8	L1	CO1
		OR			
Q.2	a.	Similarities between electric and magnetic circuits.	8	L2	CO1
	b.	Two coils having 150 and 200 turns are wound on a closed magnetic core of cross section 1.5×10^{-3} m^2 and mean length 3 m. The relative permeability is 2000. Calculate (i) The mutual inductance between the coils (ii) Voltage induced in the second coil if the current changes from 0 to 10 A in the First coil in 20 ms.	6	L3	CO1
	c.	Derive an expression for mutually induced emf.	6	L3	CO1
		Module – 2			
Q.3	a.	Derive the relation between V and I when AC is applied to RLC series circuit. Draw Phasor diagrams.	8	L3	CO2
	b.	An AC quantity is given by the expression i(t) = 40 sin (314t)A. Determine maximum value of current, peak to peak value, angular velocity, frequency, time period and also determine the value of instantaneous current at the time 3 milli seconds.	6	L3	CO2
	c.	Classify the types of power in AC circuit.	6	L2	CO2

		OR			
Q.4	a.	A resistance of 15 Ω is connected in series with an inductance of 0.25 H across 220 V, 50 Hz ac supply. Find (i) Total impedance (ii) Current through the circuit (iii) Voltage across the resistance (iv) Voltage across the inductance (v) Power factor (vi) Phase angle between voltage and current (vii) Active reactive and apparent power (viii) Equation for instantaneous voltage and current.	8	L3	CO2
	b.	Derive the relation between V and I when AC is applied to RL series circuit.	6	L3	CO2
	c.	Define average and rms values of sinusoidal voltage. Also derive the respective expressions.	6	L2	CO2
		Module – 3			
Q.5	a.	How do you generate 3-phase supply? Give the 3-phase expression and the advantages of 3-phase.	8	L2	CO2
	b.	3 coils each having resistance of 10 Ω and inductance of 0.02 H are connected in star across 440 V, 50 Hz supply. Calculate the line current and total power consumed.	6	L2	CO2
	c.	Define the following terms with respect to 3-phase supply: (i) Line current (ii) Line voltage (iii) Phase current (iv) Phase voltage (v) Total 3-phase power with a help of circuit diagram.	6	L2	CO2
		OR			
Q.6	a.	3 similar coils each having resistance of 10 Ω and 8 Ω inductive reactance are connected in star across 400 V, balanced 3 ϕ supply. Determine : (i) Line current (ii) Total power (iii) Reading of each of two watt meter connected to measure power.	6	L3	CO2
	b.	Obtain the relationship between the line and phase values of voltage and current in delta connection.	8	L3	CO2
	c.	Find the total power, power factor of the circuit shown.  Fig. Q6 (c)	6	L3	CO2
		Module – 4			
Q.7	a.	Explain the construction and working of Kelvin's double bridge.	7	L2	CO4
	b.	With a neat sketch, explain current transformer.	6	L2	CO4
	c.	Write short notes on Domestic wiring.	7	L2	CO5
		OR			
Q.8	a.	Explain the construction and working of Megger.	6	L2	CO4
	b.	Explain the construction of Maxwell's Bridge and derive the expression for unknown inductance.	8	L2	CO4
	c.	Explain two way and three way control of lamp with truth table.	6	L2	CO5

		Module – 5			
Q.9	**a.**	Define earthing, with neat diagram explain plate earthing.	**6**	**L2**	**CO5**
	b.	List out the power rating of household appliances including air conditioners, PC's, Laptops and Printers. Find total power consumed.	**8**	**L2**	**CO5**
	c.	With a neat circuit diagram, explain the operation of Earth Leakage Circuit Breaker (ELCB).	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	With diagram, explain the working of fuse and characteristics of fuse material.	**6**	**L2**	**CO5**
	b.	Define "unit" used for consumption of electrical energy and explain the two part tariff with its advantages and disadvantages.	**8**	**L2**	**CO5**
	c.	Write short notes on Miniature circuit Breaker and list its merits and demerits.	**6**	**L2**	**CO5**

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CBCS SCHEME

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

21ELE13/23

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State and explain Kirchhoff's laws as applied to on electric circuit. **(06 Marks)**

b. Derive the relation between i) RMS value and maximum value ii) Average value and maximum value for a purely sinusoidal alternating quantity. **(08 Marks)**

c. A resistance of 10Ω is connected in series with two resistances each of 15Ω arranged in parallel. What resistance must be shunted across this parallel combination, so that the total current will be 1.5A from 20V supply applied? **(06 Marks)**

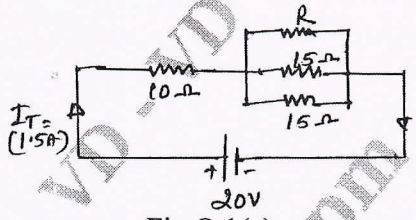

Fig.Q.1(c)

OR

2 a. State and explain maximum power Transfer theorem as applied to the DC series circuit. **(06 Marks)**

b. Show that power consumed by the pure capacitor is zero. Draw the voltage, current and power waveforms. **(08 Marks)**

c. The equation of an alternating current is given by i = 42.42 sin 628t. Calculate its i) Maximum value ii) Frequency iii) RMS value iv) Average value v) Form factor vi) Peak factor. **(06 Marks)**

Module-2

3 a. Analyze the R-C series circuit and show that current leads the voltage, using phasor diagram. **(07 Marks)**

b. Deduce the relationship between line and phase value of voltage and current in 3ϕ star connection. Also write 3ϕ power equation. **(06 Marks)**

c. A circuit consists of a resistance 10Ω, an inductance of 16mH and a capacitor of 150μF connected in series. A supply of 100V, 50Hz is applied to the circuit. Find the current, power factor and power consumed by the circuit. Draw the phasor diagram. **(07 Marks)**

OR

4 a. Show that only two-wattmeters are sufficient to measure the 3ϕ power, using phasor diagram. **(07 Marks)**

b. Deduce the relationship between line and phase values of current in 3ϕ delta connection. Also write the 3ϕ power equations. **(06 Marks)**

c. Three similar chocking coils each having resistance of 10Ω and inductive reactance of 10Ω are connected in star across a 440V, 50Hz supply. Find the line current and readings of each of two wattmeters. **(07 Marks)**

Module-3

5 a. With a neat sketch, explain the construction of various parts of DC generator. **(08 Marks)**

b. Derive the torque equation of DC motor with usual notation. **(06 Marks)**

c. The primary winding of a transformer is connected to a 240V, 50Hz supply. The secondary winding has 1500 turns. If maximum flux of the core is 0.00207 Wb. Determine: i) The secondary induced emf ii) No. of turns in the primary iii) Core area, if the maximum Flux density is given 0.465Wb/m^2. **(06 Marks)**

OR

6 a. Derive the condition for maximum efficiency of a single phase transformer. **(08 Marks)**

b. With usual notation, derive the EMF equation of a DC generator. **(06 Marks)**

c. A 4-pole, 500V, dc shunt motor have 720 conductors with wave connected on its armature. If the full load current is 60A and the flux per pole is 0.03Wb. The armature resistance and shunt field resistance are 0.2Ω and 250Ω respectively and the contact drop is 1 volt per brush. Calculate the full load speed of the motor. **(06 Marks)**

Module-4

7 a. Explain the concept of rotating magnetic field of 3ϕ induction motor, with the help of vector diagrams. **(08 Marks)**

b. With usual notation, derive the EMF equation of 3ϕ synchronous generator. **(06 Marks)**

c. A 3ϕ, 6 pole, star connected alternator has an armature with 90 slots and 12 conductors per slot. If it rotates at 1000 rpm, the flux per pole is 0.05Wb. Calculate the line value of emf generated. If short pitch factor is 0.97 and distribution factor is 0.96. **(06 Marks)**

OR

8 a. List the difference between salient pole type rotor and non salient pole type rotor construction. **(08 Marks)**

b. Define slip, derive the expression for frequency of rotor current. **(06 Marks)**

c. A 6 pole alternator runs at 1000rpm supplies power to a 4 pole Induction motor. The frequency of rotor of induction motor is 2Hz. Determine the slip and speed of the motor. **(06 Marks)**

Module-5

9 a. Draw and explain the single line diagram of a typical transmission and distribution system scheme. **(08 Marks)**

b. What is earthing? With a neat diagram explain pipe earthing. **(06 Marks)**

c. Explain the working principle of fuse and MCB. **(06 Marks)**

OR

10 a. What are the desirable characteristics of a tariff and explain two-part tariff. **(08 Marks)**

b. What is electric shock? What are the safety precautions to be taken while working with electricity to avoid shock? **(06 Marks)**

c. With the help of block diagram, discuss law voltage distribution system. (400V and 230V) for various consumers. **(06 Marks)**

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13

CBCS SCHEME

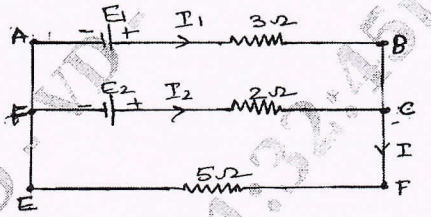
USN | | | | | | | | | | |

BEEE103

First Semester B.E./B.Tech. Degree Examination, Jan./Feb. 2023
Element of Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Electrical Power and Energy. Mention the limitations of Ohm's law.	6	L1	CO1
	b.	Prove the relation between Self and Mutual induction.	6	L1	CO1
	c.	A coil consists of 600 turns and a current of 10A in the coil gives rise to a magnetic flux of 1 m wb. Calculate i) Self Inductance ii) Self Induced emf iii) Energy stored when the current is reversed in 0.01 seconds.	8	L2	CO1
		OR			
Q.2	a.	State i) Lenz's law ii) Flemings Left Hand rule iii) Flemings Right Hand rule.	6	L1	CO1
	b.	Derive the expression for energy stored in inductor.	6	L2	CO1
	c.	In the circuit shown, find the voltage sources E_1 and E_2 such that the power dimpated in 5 Ω resistor is 125 watts. 	8	L2	CO1
		Module – 2			
Q.3	a.	Show that the power consumed in a pure capacitive circuit is zero with the help of voltage and current and power waveform.	6	L2	CO2
	b.	A coil when connected to 200V, 50Hz supply takes a current of 10A and dissipate 1200W. Find the resistance and inductance of the coil.	6	L3	CO2
	c.	Define the following terms : i) Instantaneous value ii) Peak – to – peak value iii) Peak amplitude iv) Average value.	8	L1	CO2
		OR			
Q.4	a.	Show that voltage and current in pure resistive circuit is in phase with each other. Also derive the equation for power consumed.	6	L2	CO2
	b.	Define Average and RMS value of sinusoidal voltage / current. Also derive the respective expression.	6	L2	CO2
	c.	Two impedances (150 – j157) Ω and (100 + j110) Ω are connected in parallel across 200V, 50 Hz supply. Find branch currents , total current and total power consumed in circuit. Draw the phasor diagram.	8	L3	CO2

		Module – 3			
Q.5	**a.**	Obtain the relationship between line and phase values of voltage and current in a balanced 3 – phase delta connected system.	**6**	**L2**	**CO3**
	b.	Three similar coils each having resistance of 10Ω and 8Ω inductive resistance is connected in star across 400V, balanced 3 – phase supply. Determine i) Line current ii) Total power iii) reading of each of two wattmeter connected to measure power.	**8**	**L3**	**CO3**
	c.	A balanced three phase star connected load draws power from a 440V supply. The two watt meters connected indicates W_1 = 4.2 kW , W_2 = 0.8 kW. Calculate the power , power factor and current in the circuit.	**6**	**L3**	**CO3**
		OR			
Q.6	**a.**	With a neat circuit diagram and phasor diagram, prove that two Watt meters are sufficient to measure 3 - ϕ power.	**8**	**L1**	**CO3**
	b.	What are the advantages of 3 – phase system over single phase system?	**6**	**L2**	**CO3**
	c.	A 3 - ϕ star connected system has 4Ω resistance in series with an inductance of 10mH per phase, if the applied voltage is 450V, 50Hz. Find the power drawn by circuit.	**6**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the construction and working of wheat stone's Bridge.	**8**	**L2**	**CO4**
	b.	Describe the factors affecting the choice of a wiring system.	**6**	**L2**	**CO4**
	c.	Mention the difference between Current and Potential transform.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain Case and Capping wiring.	**7**	**L2**	**CO4**
	b.	Mentioning the advantages of two ways and three ways control of lamp circuit, give the example where these two circuits are used.	**7**	**L2**	**CO4**
	c.	Explain the construction of Maxwell's Bridge.	**6**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define Earthing. With neat diagram, explain pipe earthing.	**8**	**L2**	**CO5**
	b.	Write a note on RCCB.	**6**	**L2**	**CO5**
	c.	Write a short note on Fuse and MCB.	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	What are the characteristics of tariff? Explain two part tariff.	**7**	**L2**	**CO5**
	b.	Define Shock. What are the precautions against electric shock?	**5**	**L2**	**CO5**
	c.	List out the power rating of household appliances including air conditioners, PC's Laptops, Printers etc. Find the total power consumed.	**8**	**L3**	**CO5**

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CBCS SCHEME

14

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

18ELE13/23

First/Second Semester B.E. Degree Examination, July/August 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. State and explain: i) Ohm's law ii) Kirchoff's voltage law. **(06 Marks)**

b. Define: i) frequency ii) time period iii) form factor. **(06 Marks)**

c. Determine:
   i) Current flowing through 12Ω and 8Ω resistances
   ii) Total power dissipated
   iii) Power dissipated in all resistors. **(08 Marks)**

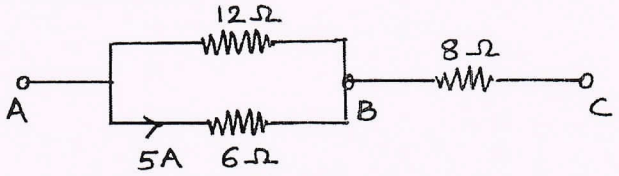

Fig.Q.1(c)

2 a. Define the RMS value of an alternating current and show that its value is proportional to maximum value. **(06 Marks)**

b. Apply Kirchoff's laws to calculate the current in 2Ω resistor in Fig.Q.2(b). **(06 Marks)**

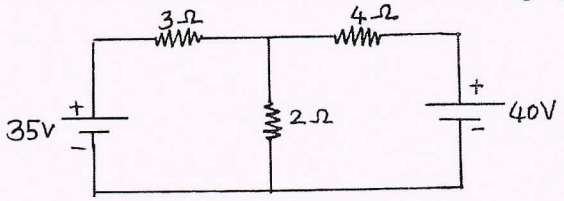

Fig.Q.2(b)

c. An alternating current 'i' is given by i = 141.4 sin 314t, find: i) maximum value ii) frequency iii) time period iv) instantaneous value when t = 3ms. **(08 Marks)**

3 a. Show that current lags the applied voltage v = vm sin wt by 90 in a pure inductive A-C circuit and also power consumed is zero. **(08 Marks)**

b. List the advantages of 3 phase A.C system over 1 phase A.C system. **(06 Marks)**

c. A 318μF capacitor is connected across a 230volts, 50Hz, AC supply. Determine: i) Capacitive reactance ii) RMS value of current iii) Voltage and current expressions. **(06 Marks)**

4 a. Show that the power in a 3 phase balanced star connected load can be measured by two wattmeters with suitable circuit diagram and vector diagrams. **(08 Marks)**

b. Explain the following with respect to single phase A.C system:
   i) Power factor
   ii) True power
   iii) Reactive power
   iv) Apparent power **(06 Marks)**

c. Three 50Ω resistors are connected in star across 400V, 3 phase, 50Hz, AC supply. Find phase current, line current and power taken from the mains. **(06 Marks)**

5 a. Explain the basic working principle of transformer and identify the applications of transformers (any two). **(06 Marks)**

b. Explain the two way control of lamp with suitable diagram and working table. **(06 Marks)**

c. A single phase, 50Hz, transformer has 30 primary turns and 350 secondary turns. The net cross sectional area of the core is 250cm^2. If the primary winding is connected to a 230V, 50Hz, AC supply. Calculate:
   i) Peak value of flux density in the core
   ii) Voltage induced in the secondary winding
   iii) Primary current when the secondary current is 100A (Neglecting losses). **(08 Marks)**

6 a. Explain the concealed conduit wiring with a neat diagram and mention its advantages. **(08 Marks)**

b. A 10KVA transformer has iron loss of 450W and full load copper loss of 650W. If the power factor of the load is 0.8 lagging. Calculate: i) Full load efficiency ii) Load at maximum η iii) Maximum efficiency at unity power factor. **(06 Marks)**

c. Explain the following with respect to electric circuit i) Earthing ii) Electric shock iii) Fuse wire iv) MCB v) meter board. **(06 Marks)**

7 a. Explain the basic working principle of d.c generator with suitable diagrams. **(06 Marks)**

b. What is torque? Show that the armature torque is proportional to armature current in d.c motor. **(06 Marks)**

c. An 8 pole lap connected armature has 960 conductors, a flux of 40mwb per pole and a speed of 400RPM. Calculate the emf generated. If the armature were wave connected, at what speed it must be driven to generate 400V? **(08 Marks)**

8 a. How the dc generators are classified? Explain each one in brief. **(06 Marks)**

b. Explain the D.C series motor characteristics with suitable plots. **(06 Marks)**

c. A 250V, shunt motor takes a total current of 20A Rsh = 200Ω, Ra = 0.3Ω. Find the current in armature and back emf. **(08 Marks)**

9 a. Explain the constructional details of 3 phase synchronous generator. **(06 Marks)**

b. A 3 ph, induction motor is wound for 4 poles and is supplied from 50Hz system. Calculate: i) Synchronous speed ii) Speed of motor when slip is 4% iii) rotor current frequency when motor runs at 600rpm. **(08 Marks)**

c. Derive an expression to calculate the frequency of generated emf. **(06 Marks)**

10 a. Explain the basic working principle of 3 phase induction motor with suitable diagrams. **(06 Marks)**

b. A 6 pole, 3 phase, 50Hz, alternator has 12 slots per pole and 4 conductors per slot. A flux of 25mWb is sinusoidally distributed along the air gap. Determine the i) Phase EMF ii) Line EMF, is the alternator is star connected. Assume pitch factor = 1 winding factor = 0.96. **(06 Marks)**

c. Why the 3 phase induction motor stops at slip = 0, explain the working of star-delta starter with a neat diagram. **(08 Marks)**

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15

CBCS SCHEME

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

17ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions.*

1 a. State and explain Kirchoff's laws with one illustration each. **(06 Marks)**

b. For the network shown below in Fig.Q1(b), determine all the branch currents.

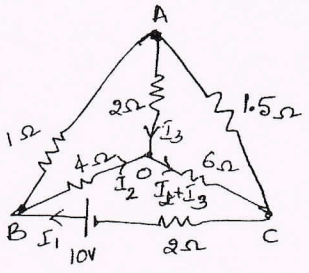

Fig.Q1(b) **(08 Marks)**

c. State the following :
i) Flemings right hand rule
ii) Flemings left hand rule. **(06 Marks)**

2 a. State explain Faraday's Laws of electromagnetic induction. **(06 Marks)**

b. Find the inductance of a coil of 200 turns wound on a paper core tube of 25cm length and 5cm radius. Also calculate energy stored in it if current rises from zero to 5A ($\mu_r = 1$). **(08 Marks)**

c. Obtain the relation between self inductance, mutual inductance and co-efficient of coupling. **(06 Marks)**

3 a. With a neat diagram, explain the construction of a DC generator. **(08 Marks)**

b. With neat sketches explain the characteristics of a DC shunt motor. **(06 Marks)**

c. A 4pole, 100V shunt generator with lap connected armature, having field and armature resistance of 50Ω and 0.1Ω respectively, supplies sixty, 100V, 40W lamps. Calculate the total armature current, the current per path and the generated emf. Allow a contact drop of 1volt per brush. **(06 Marks)**

4 a. With a neat diagram explain the construction and working of an induction type energymeter. **(06 Marks)**

b. A four-pole DC shunt motor takes 22.5A from a 250V supply. $R_a = 0.5\Omega$ and $R_f = 125\Omega$. The armature is wave-wound with 300 conductors. If the flux per pole is 0.02wb, calculate :
i) The speed
ii) Torque developed
iii) Power developed. **(08 Marks)**

c. Derive the expression for armature torque developed in a DC motor. **(06 Marks)**

5 a. With a neat connection diagram and switching table, explain 3 way control of lamp. **(06 Marks)**

b. Obtain the expression for the current through the pure inductor, if the voltage across it is $v = V_m \sin\omega t$. **(06 Marks)**

c. Two impedances $20\angle -45°\Omega$ and $30\angle 30°\Omega$ are connected in series across a certain AC supply and the resulting current is found to be 10Amps. If the supply voltage remains unchanged calculate the supply current when the two impedances are connected in parallel. **(08 Marks)**

6 a. Write a short note on :
i) Necessity of earthing
ii) Precautions to be taken to prevent electric shock. **(08 Marks)**

b. A series circuit with $R = 10\Omega$, $L = 50mH$ and $C = 100\mu F$ is supplied with 200V, 50Hz. Find:
i) The impedance ii) Current iii) Power iv) Power factor. **(06 Marks)**

c. Define real power, reactive power, apparent power and power factor. **(06 Marks)**

7 a. Obtain the relationship between line and phase voltage and current in a 3ϕ balanced star connected system. **(08 Marks)**

b. A 440V, 3 phase AC motor has an output of 80Hp and operates at a power factor of 0.866 with an efficiency of 90% calculate :
i) The current in each phase of the motor if the motor is delta connected.
ii) The readings of the two waltmeters connected in the lines to measure the input power. **(06 Marks)**

c. With usual notation derive the expression for EMF equation of an alternator. **(06 Marks)**

8 a. Show that the power in a balanced 3-phase circuit can be measured by 2 wattmeter. Draw the circuit and vector diagram. **(08 Marks)**

b. Mention different types of synchronous generator and explain the construction of each type. **(06 Marks)**

c. A 3-phase, 50Hz 16-pole generator with star connected winding has 144 slots with 10 conductor/slot. The flux | pole 24.8mwb is sinusoidally distributed. The coils are full pitched. Find : i) speed ii) the line emf. Given $k_d = 0.96$. **(06 Marks)**

9 a. Derive the condition for which the efficiency of a transformer is maximum. Also derive the emf equation of a transformer. **(08 Marks)**

b. If the electromotive force in the stator of an 8 pole induction motor has a frequency of 50Hz and that in the rotor 1.5Hz, at what speed is the motor running and what is the slip? **(06 Marks)**

c. Define slip. Derive an expression for frequency of rotor current. **(06 Marks)**

10 a. With neat diagram, explain the construction of types of rctor of 3ϕ induction motor. **(06 Marks)**

b. A 600KVA single phase transformer has an efficiency of 92% both at full–load and half load at unity power factor. Determine its efficiency at 75% of full load at 0.9 power factor lag. **(08 Marks)**

c. Explain why induction motor never runs at synchronous speed. **(06 Marks)**

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16

CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 a. For the circuit shown in Fig.Q1(a), find V_1 and I_1.

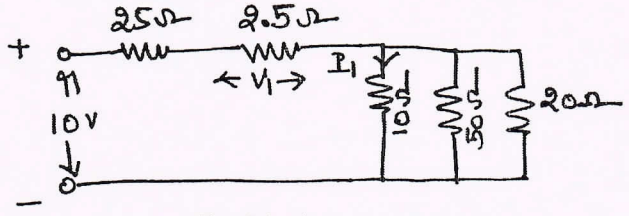

Fig.Q1(a) **(06 Marks)**

b. State and explain Faradays law of Electromagnetic induction. **(05 Marks)**

c. Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that, 60% of the flux produced by one coil links the other. If a current of 10A flowing in the first coil produces a flux of 0.5 mWb, find the inductance of the second coil. **(05 Marks)**

2 a. The current in the 6Ω resistance of the network shown in Fig.Q2(a) is 2A. Determine the currents in all the branches and the applied voltage.

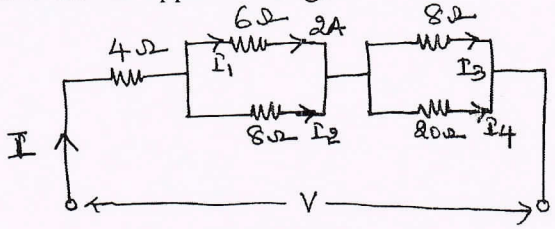

Fig.Q2(a) **(06 Marks)**

b. Derive an expression for energy stored in an inductive coil. **(04 Marks)**

c. A coil of 1000 turns is wound on a ring of Silicon steel, having a mean diameter of 10 cm and relative permeability of 1200. Its cross sectional area is 12 sq.cm. When a current of 5A flows through the coil, find: (i) The flux in the core (ii) The inductance of the coil and (iii) The induced emf, if the flux falls to zero in 20 milli seconds. **(06 Marks)**

3 a. A 8 pole wave wound DC shunt generator has 36 slots, 10 conductors in each slot. The flux per pole is 0.01 Wb. It runs at 1200 rpm. The armature and field resistances are 0.1Ω and 100Ω respectively. Calculate the terminal voltage when load current is 120 A. **(06 Marks)**

b. Derive an equation for the torque developed in the armature of a D.C. motor. **(05 Marks)**

c. With a neat figure, explain the construction and working principle of a dynamometer type Wattmeter. **(05 Marks)**

4 a. Derive the E.M.F. equation of a D.C. Generator. **(05 Marks)**

b. A shunt D.C. machine connected to 250 V supply has an armature resistance of 0.12 Ω and the field resistance of 100 Ω. Find the ratio of the speed of the machine as a generator to the speed as a motor, the line current in each case being 80 A. **(06 Marks)**

c. With a neat sketch, explain the construction and working principle of an Induction type single phase energy meter. **(05 Marks)**

5 a. Define effective value of a sinusoidally varying current and find its relation with its maximum value. **(05 Marks)**

b. Find the total current, power and power factor of the circuit given in Fig.Q5(b).

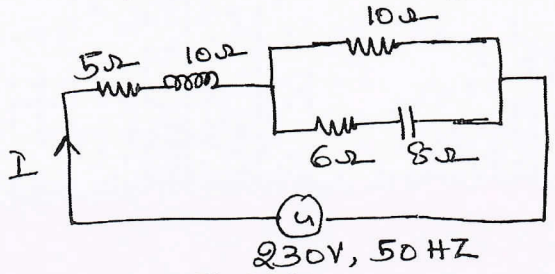

Fig.Q5(b) **(06 Marks)**

c. With a circuit diagram, explain the working of a two way control of a lamp. **(05 Marks)**

6 a. Draw the triangle of voltages and impedance triangle of series R-C circuit. **(05 Marks)**

b. A circuit consists of a resistance of 10 Ω, an inductance of 16 mH and a capacitance of 150 μF are connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. **(06 Marks)**

c. What is an electric shock? What are the precautions to be taken to prevent shocks occurring? **(05 Marks)**

7 a. Show that the two wattmeters are sufficient to measure three phase power. **(05 Marks)**

b. Three 100 Ω resistance are connected in (i) star and (ii) delta across a 415 V, 50 Hz, 3 phase supply. Calculate the line and phase currents and the power consumed in each case. **(06 Marks)**

c. With neat figure, explain the constructional details of an alternator. **(05 Marks)**

8 a. In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. **(05 Marks)**

b. Two wattmeters are connected to measure the input to a 3 phase, 12 H.P., 50 Hz, induction motor which works at a full load efficiency of 85% and a power factor of 0.8. Find the readings of the two wattmeters. **(05 Marks)**

c. Derive the EMF equation of alternator. **(06 Marks)**

9 a. Derive an E.M.F. equation of a transformer. **(05 Marks)**

b. 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 power factor lagging. Determine the iron loss. What would be the efficiency at half of the full load and unity power factor? **(06 Marks)**

c. A 4 pole, 50 Hz induction motor ha a slip 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. **(05 Marks)**

10 a. Explain the different losses occurring in a transformer. **(05 Marks)**

b. A single phase, 20 kVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is 100 cm^2. When the primary winding is connected to 500 V, 50 Hz supply, calculate:
(i) The maximum value of the flux density in the core
(ii) The voltage induced in the secondary winding
(iii) The primary and secondary full load currents. **(06 Marks)**

c. The frequency of the emf in the stator of a 4 pole induction motor is 50 Hz and that in the rotor is 1.5 Hz. What is the slip and at what speed the motor is running? **(05 Marks)**

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14ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. State and explain Kirchoff's laws as applied to DC circuit. **(06 Marks)**

b. Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that 60% of flux produced by one coil links the other. If a current of 10A, flowing in the first coil, produces a flux of 0.5mwb find self inductance, mutual inductance and the coefficient of coupling is 0.6. **(06 Marks)**

c. In the circuit shown in Fig.Q1(c), find E_1, E_2 and I when the power dissipated in the 5Ω resistor is 125 watts.

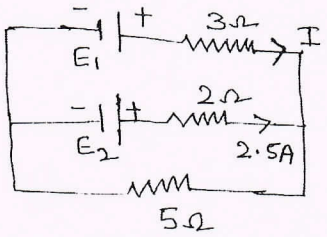

Fig.Q1(c) **(08 Marks)**

2 a. Define the following terms :
i) MMF ii) Magnetic field intensity iii) Flux density iv) Reluctance. **(06 Marks)**

b. Derive an expression for the energy stored in an inductive coil. **(06 Marks)**

c. In the circuit shown in Fig.Q2(c), what is the voltage across AB if,
i) switch S is open ii) Switch S is closed.

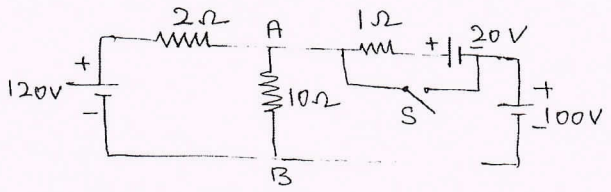

Fig.Q2(c) **(08 Marks)**

3 a. Explain with a neat sketch the parts of a DC generators and mention the functions of each part. **(06 Marks)**

b. Explain with a neat diagram, the constructional features and operation of dynamometer type wattmeter. **(06 Marks)**

c. A shunt generator delivers 100KW at 250V, when running at 400rpm. The armature resistance is 0.01Ω and field resistance is 100Ω if the same machine is run as a shunt motor with an input of 100KW at 250V, calculate the speed of the machine as a motor, contact drop per brush is 1V. **(08 Marks)**

4 a. Derive an expression for the torque developed by a DC motor. **(06 Marks)**

b. Explain with a neat diagram, the constructional features and operation of an induction type single phase energy meters. **(06 Marks)**

c. A 4 pole DC shunt motor takes 22.5 amperes from 250V supply. $R_a = 0.5\Omega$ and $R_f = 125\Omega$. The armature is wave–wound with 300 conductors. If the flux per pole is 0.02wb, calculate : i) The speed ii) torque developed iii) power developed. **(08 Marks)**

5 a. Derive an expression for RMS value of a sinusoidal wave. **(06 Marks)**

b. With diagram, explain two-way and three control of lamp. **(06 Marks)**

c. Two circuits A and B connected in parallel across a 200volt 50Hz mains circuit A consists of a resistance of 10Ω and inductance of 0.12H connected in series, circuit B consists of a resistance 20Ω in series with a capacitor of 40μF calculate : i) Current in each branch ii) Source current ii) Power factor. Draw the phasor diagram. **(08 Marks)**

6 a. Explain with neat sketch miniature circuit breaker. **(06 Marks)**

b. With the help of circuit diagram and phasor diagram find the phase angle, impedance and power in case angle, impedance and power in case of R – L series circuit. **(06 Marks)**

c. A circuit consists of a resistance of 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V 50Hz is given to the circuit. Find the current power factor, power consumed by the circuit. Draw the vector diagram. **(08 Marks)**

7 a. With the aid of a phasor diagram obtain the relationship between the line and phase values of voltages in a three phase star connected system. **(06 Marks)**

b. With neat figure, explain the salient pole rotor. **(06 Marks)**

c. Two wattmeters are connected to measure, the input to a 3 phase, 12 HP, 50Hz induction motor which works at a full load efficiency of 85% and a power factor of 0.8. Find the readings of the two wattmeters. **(08 Marks)**

8 a. Derive emf equation of an alternator. **(06 Marks)**

b. A 24 pole turbo alternator has a star connected armature winding with 144 slots and 10 conductors per slot it is driven by a low speed Kaplan turbine at a speed of 250 revolutions per minute. The winding has full pitched coils with a distribution factor of 0.966. The flux per pole is 67.3mwb. Determine:

i) The frequency and the magnitude of line voltage

ii) The output KVA of the machine if the total current in each phase is 50A. **(06 Marks)**

c. With the help of circuit diagram and phasor diagram, show that two wattmeters are sufficient to measure the active power in a three phase wire system with balanced star connected load. **(08 Marks)**

9 a. What are the losses in a transformer and how they vary with load? Deduce a condition for maximum efficiency. **(06 Marks)**

b. Explain the working principle of a 3 phase induction motor. **(06 Marks)**

c. A single phase 25KVA 1000/2000V 50Hz transformer has maximum efficiency of 98% at full load unity power factor. Determine its efficiency at :

i) $\frac{3}{4}$ full load unity power factor

ii) $\frac{1}{2}$ full load 0.8 power factor

iii) 1.2 full load 0.9 power factor. **(08 Marks)**

10 a. Derive an expression for the emf induced in a transformer. **(06 Marks)**

b. A 3-phase, 6-pole, 50Hz induction motor has a slip of 1% at no-load and 3% at full load. Determine : i) Synchronous speed ii) No – load speed iii) Full–load speed iv) Frequency of rotor current at stand still v) Frequency of rotor current at full load. **(06 Marks)**

c. Prove that a rotating magnetic field of constant magnitude is produced when the stator winding of a 3 phase induction motor is energized by a balanced 3 phase supply. **(08 Marks)**

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MAKE-UP EXAM

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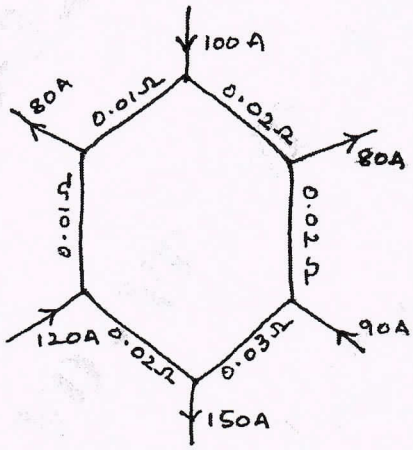
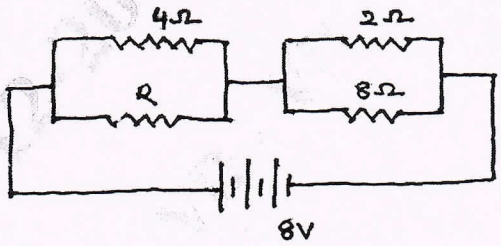
BESCK204B/BESCKB204

Second Semester B.E./B.Tech. Degree Examination, Nov./Dec.2023
Introduction to Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	With block diagram, explain hydel power generation.	6	L1	CO1
	b.	State and explain Ohm's law with its limitations.	6	L1	CO1
	c.	Find the current in the various branches of the given network shown in Fig. Q1 (c).  Fig. Q1 (c)	8	L3	CO1
		OR			
Q.2	a.	Write the difference between conventional and non-conventional sources.	6	L1	CO1
	b.	State and explain Kirchoff's current law and voltage law with example.	6	L1	CO1
	c.	The total power consumed by the network is 16 watts. Find the value of R and the total current as shown in Fig. Q2 (c).  Fig. Q2 (c)	8	L3	CO1
		Module – 2			
Q.3	a.	Define the following by referring a sine wave : (i) Amplitude (ii) Cycle (iii) Frequency (iv) RMS value (v) Form factor (vi) Peak factor	6	L1	CO2

	b.	Show that the current through pure Inductive circuit lags the applied voltage by 90° and average power consumed is zero. Draw the wave shapes of current, voltage and power.	6	L2	CO2
	c.	A circuit consists of a resistance of 20 Ω and inductance of 0.054 connected in series. A supply of 230 V and 50 Hz is applied across the circuit. Find the current, power factor and power consumed by the circuit.	8	L3	CO2
		OR			
Q.4	a.	Derive an equation for the power consumed by an R-C series circuit. Draw the waveforms of voltage, current and power.	6	L2	CO2
	b.	What are the advantages of three phase system over single phase system?	6	L2	CO3
	c.	A circuit consist resistance of 10 Ω, inductance of 16 mH and a capacitance of 150 μF connected in series. A supply voltage of 100 V at 50 Hz is given to the circuit. Find the current, power factor and power consumed by the circuit.	8	L3	CO3
		Module – 3			
Q.5	a.	With a neat sketch, explain the construction of the various parts of a D.C generator and the purpose they save.	8	L2	CO3
	b.	A 30 kW, 300 V DC shunt generator has armature and field resistance of 0.05 Ω and 100 Ω respectively. Calculate the total power developed by the armature when it delivers full output power.	8	L3	CO3
	c.	With usual notations derive an emf equation of DC generator.	4	L2	CO3
		OR			
Q.6	a.	Derive an expression of armature torque developed in a DC motor.	8	L2	CO3
	b.	A 4 pole DC shunt motor takes 22.5 A from 250 V supply. If armature resistance and shunt field resistance is 0.5 Ω and 125 Ω respectively. The armature is wave wound with 300 conductors if the flux per pole is 0.02 wb. Calculate the speed, torque developed and power developed.	8	L3	CO3
	c.	What is the significance of back emf of a D.C. motor?	4	L3	CO3
		Module – 4			
Q.7	a.	Derive the EMF equation of a transformer.	6	L2	CO3
	b.	Explain the various losses in a transformer and how they are minimized.	8	L2	CO3
	c.	A transformer is rated at 200 KVA at full load its copper losses is 1800 W and its iron losses is 750 W. Calculate (i) The efficiency at full load 0.9 P.F. (ii) The efficiency at half load 0.8 PF (iii) The efficiency at $\frac{1}{4}^{th}$ load 0.6 P.F.	6	L3	CO3
		OR			
Q.8	a.	Show that a rotating magnetic field is produced when a three phase balance supply is given to the stator winding of a 3ϕ IM.	8	L3	CO2
	b.	Write the difference between squirrel cage and slip ring induction motor.	6	L2	CO2
	c.	A 6 pole induction motor (IM) is supplied by a 10 pole alternator which is running at 600 rpm. If the motor is running at 970 rpm. Calculate the percentage slip.	6	L3	CO2

		Module – 5			
Q.9	**a.**	With a neat circuit diagram and switching table, explain two way and three way control of lamp.	**8**	**L2**	**CO5**
	b.	With diagram, explain the working of MCB.	**6**	**L2**	**CO5**
	c.	What is Earthing? With neat diagram, explain the plate Earthing.	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	Define "Unit" used for consumption of electrical energy and explain the two part tariff with its advantages and disadvantages.	**8**	**L1**	**CO5**
	b.	What is electric shock? Give the list of preventive measures against the shock.	**6**	**L1**	**CO5**
	c.	List out the power rating of household appliances including, (i) Air conditioners 1 ton – 1 No. (ii) Computer – 1 No. (iii) Fridge – 1 No. (iv) DVD player – 1 No. (v) Ceiling fan – 1 No. Find the total power consumed.	**6**	**L1**	**CO5**

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CBCS SCHEME

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

21ELE13

First Semester B.E./B.Tech. Degree Examination, Feb./Mar. 2022
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. State Kirchoff's law for DC circuits. Illustrate with an example. **(08 Marks)**

b. What is the voltage across A and B in the circuit shown in Fig.Q.1(b). **(06 Marks)**

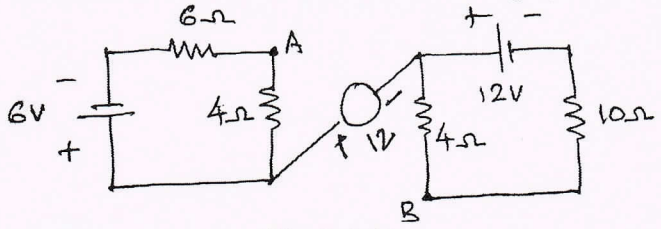

Fig.Q.1(b)

c. Define the following terms:
i) Average value
ii) RMS value
iii) Form factor. **(06 Marks)**

OR

2 a. Prove that the maximum power will be transferred to the load when load resistance is equal to the source resistance. **(06 Marks)**

b. A pure inductor excited by sinusoidal varying AC voltage, show that the average power consumed by inductor is zero. **(08 Marks)**

c. A 318μF capacitor is connected across a 230V, 50Hz system. Determine: i) Capacitive reactance ii) RMS value of current iii) Extrusions for instantaneous voltage and current v(t) and i(t). **(06 Marks)**

Module-2

3 a. Define: i) Real power ii) Reactive power iii) Power factor. **(06 Marks)**

b. A series circuit with R = 10Ω, L = 50mH and C = 100μF is supplied with 200V, 50Hz. Find: i) The impedance ii) Current iii) Power iv) Power factor. **(08 Marks)**

c. Deduce the relationship between the phase and the line voltages of a three phase star connected system. **(06 Marks)**

OR

4 a. Deduce the relationship between the phase and the line current of a three phase delta connected system. **(06 Marks)**

b. A balanced star connected load of (8 + j6)Ω per phase is connected to a three phase 230V supply. Find the current, power factor, power, reactive volt ampere and total voltampere. **(05 Marks)**

c. Three phase power consumed by the balanced load is given by $P = \sqrt{3}\ V_L\ I_L \cos\phi$ watts, then show that two wattmeter is sufficient to measure three phase power P. **(09 Marks)**

Module-3

5 a. With neat sketch, explain the different parts of a DC generators. **(06 Marks)**

b. Give the classification of DC generator. Obtain the expression for EMf equation of a DC generator. **(08 Marks)**

c. Give broad classification of transformers. Explain the construction of transformer. **(06 Marks)**

OR

6 a. Derive the expression for emf induced in the primary or secondary side of a transformer. **(06 Marks)**

b. Derive an expression for the torque developed by a DC motor. **(06 Marks)**

c. A 250KVA, 11000/415V, 50Hz single phase transformer has 80 turns on the secondary, calculate:

i) Rated primary and secondary currents.

ii) Number of primary turns.

iii) Maximum value of core flux.

iv) Voltage induced per turn. **(08 Marks)**

Module-4

7 a. Explain the concept of rotating magnetic field in case of stator field a 3-phase induction machine with a neat diagram. **(08 Marks)**

b. Define slip of an induction motor and derive expression for the frequency of rotor currents. **(06 Marks)**

c. Describe the main parts of synchronous generator with neat sketches. **(06 Marks)**

OR

8 a. A 3 phase induction motor with 4 poles is supplied from an alternator having 6 poles and running at 1000rpm. Calculate synchronous speed of the induction motor, its speed when slip is 0.04 and frequency of the rotor emf when speed is 600rpm. **(08 Marks)**

b. Derive the emf equation of a synchronous generator. **(06 Marks)**

c. A 24 pole turbo alternator has a star connected armature winding with 144 slots and 10 conductors per slot. It is driven by a low speed Kaplan turbine at a speed of 250rpm. The winding has full pitched coils with a distribution factor of 0.966. The flux per pole is 67.3mWb. Determine: i) Frequency and magnitude of the line voltage ii) Output KVA of the machine if the total current in each phase is 50A. **(06 Marks)**

Module-5

9 a. What is electric power supply system? Draw a single line diagram of a typical a.c supply scheme. **(06 Marks)**

b. What is the necessity of earthing? Explain plate earthing. **(08 Marks)**

c. Explain the working principle of fuse and MCB. **(06 Marks)**

OR

10 a. Explain components of low voltage distribution system with neat sketches. **(06 Marks)**

b. A consumer uses a 10kW geezer, a 6kW electric furnace and five 100W bulbs for 8 hours. How many units of electrical energy have been used? Define an electrical energy unit. **(06 Marks)**

c. What do you mean by electric shock? Write a short note on precautions against an electric shock. **(08 Marks)**

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