CBCS SCHEME

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BEEE103/203

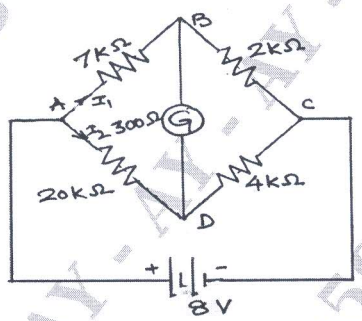
First/Second Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

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 Data 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 Kirchhoff's laws with the help of suitable examples.	06	L2	CO1
	b.	State and explain Faraday's laws of electromagnetic induction.	06	L2	CO1
	c.	A circuit consists of two parallel resistors having resistance of 20Ω and 30Ω and the combination is connected in series with 15Ω. If current through 15Ω resistor is 3A. Find: (i) Current in 20Ω and 30Ω resistors (ii) Voltage across the whole circuit (iii) The total power and power consumed in all resistances.	08	L3	CO1
		OR			
Q.2	a.	State and explain ohm's law. Mention its limitations.	05	L2	CO1
	b.	Explain statically induced emf and dynamically induced emf. Also derive an expression for energy stored in a magnetic field.	09	L2	CO1
	c.	The winding of an electromagnet is wound with 96 turns and has a resistance of 50Ω. The exciting voltage is 250V and the flux linking the coil is 5 mWb. Find the energy stored in the magnetic field. Then, if the current is reversed in 0.1 sec, what is the induced emf?	06	L3	CO1
		Module – 2			
Q.3	a.	Draw the waveform of alternating current and denote as well as define the following terms: (i) Instantaneous value (ii) Peak value (iii) Frequency	07	L1	CO2
	b.	Show that the current lags the applied voltage in R-L circuit. Draw relevant phasor diagram.	06	L3	CO2
	c.	A series RLC circuit is composed of 100 Ω resistance 1.0H inductance, and 5μF capacitance. A voltage $\upsilon(t) = 141.4 \cos 377t$ is applied to the circuit. Find the current and voltages across resistance, inductance and capacitance.	07	L3	CO2
		OR			
Q.4	a.	With a neat sketch, explain how an alternating voltage is produced when a coil is rotated in a magnetic field.	06	L2	CO2
	b.	Show that the current through pure capacitor leads applied voltage by 90°.	06	L3	CO2
	c.	Two coils A and B are connected in parallel across 200V, 50 Hz supply. The coil A consists of 10Ω resistance and 0.12H inductance in series. Coil B consists of 20Ω resistance in series with 40μF capacitance. Calculate: (i) Current in each branch (ii) Supply current (iii) Total power	08	L3	CO2
		Module – 3			
Q.5	a.	List the advantages of three-phase system.	05	L1	CO3
	b.	Show that in a 3-phase balanced Y circuit two Wattmeters are sufficient to measure total 3-phase power.	09	L3	CO3

	c.	A 3-phase, star connected supply with a phase voltage of 230V is supplying a balanced load which is delta connected. The load draws 15 KW at 0.8 p.f. lagging. Find the line currents and the current in each phase of the load. What is the load impedance per phase?	06	L3	CO3
		OR			
Q.6	a.	Explain the necessity of three phase system.	04	L3	CO3
	b.	Obtain the relationship between line and phase values of current and voltage in three phase delta connected system.	08	L3	CO3
	c.	A balanced star connected load of $(8 + j6)\Omega$ per phase is connected to a three phase, 230 V supply. Find the line current, power factor, active power and reactive power.	08	L3	CO3
		Module – 4			
Q.7	a.	Explain the construction and working principle of Kelvin Double Bridge.	07	L2	CO4
	b.	With the help of circuit diagram and working table, explain 3-way control of lamp.	07	L3	CO4
	c.	Calculate the current through the galvanometer for the bridge shown in Fig.Q7(c).  Fig.Q7(c)	06	L3	CO4
		OR			
Q.8	a.	With the help of circuit diagram, explain the operation of Schering bridge. Also derive an expression for the capacitor.	08	L2	CO4
	b.	Explain the requirements of a good wiring.	06	L1	CO4
	c.	The bridge is balanced at 1000 Hz. The components of the bridge are: Arm AB = 0.2 μF; Arm BC = 500 Ω; Arm AD = 300 Ω in parallel with 0.1 μF. Find the constants of arm CD considering it as a series circuit.	06	L3	CO4
		Module – 5			
Q.9	a.	Define 'unit' of a electrical energy consumption and explain two part electricity tariff.	06	L2	CO5
	b.	Compare Fuse and MCB.	06	L2	CO5
	c.	Define electric shock. Mention the safety precautions to avoid electric shock.	04	L1	CO5
	d.	A consumer has a maximum demand of 200 KW at 40% of load factor. If the tariff is Rs.100 per KW of maximum demand plus 10 paise per KWh. Calculate the annual charges.	04	L3	CO5
		OR			
Q.10	a.	What is earthing? With the help of neat sketch, explain plate earthing.	06	L1	CO5
	b.	With a neat circuit, explain the operation of RCCB.	06	L1	CO5
	c.	What is fuse? Mention the properties of fusing element.	04	L1	CO5
	d.	A factory has maximum demand of 240 KW at 0.8 p.f. lagging and 60% load factor. The tariff is Rs.50 per KVA of maximum demand plus 10 paise per unit consumed. Calculate the annual bill of a consumer.	04	L1	CO5

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