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

Question Paper Code: R2B05

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Second Semester

Biomedical Engineering

R21UBM205- ELECTRICAL CIRCUITS AND MEASUREMENTS

(Regulations R2021)

Duration: Three hours | Maximum: 100 Marks

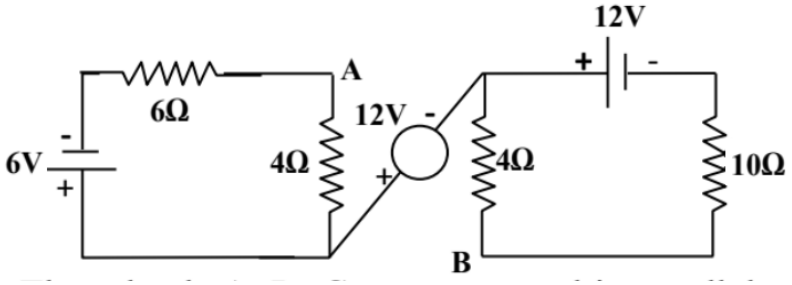
Answer All Questions

PART A - (10 x 2 = 20 Marks)

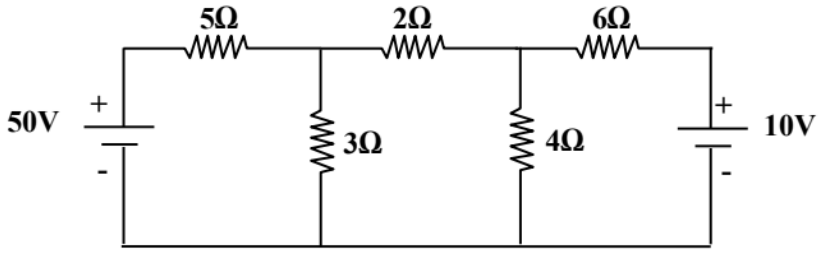
1.	Define ohm's law and its limitations.	CO1-U
2.	An alternating voltage is given by $e = 311\ sin314t$. Calculate the maximum value, average value and RMS value.	CO1-U
3.	Why do you short circuit the voltage source and open the current source when you find Thevenin's voltage of a Network?	CO1-U
4.	State the limitations of maximum power transfer theorem.	CO1-U
5.	Differentiate the series and parallel resonant circuits.	CO1-U
6.	Define Quality factor.	CO1-U
7.	Mention the advantages and disadvantages of moving iron instruments.	CO1-U
8.	Differentiate Current Transformers and Potential Transformers.	CO1-U
9.	What is the need of earthing in domestic buildings?	CO1-U
10.	Differentiate fuses and miniature circuit breakers.	CO1-U

PART – B (5 x 16= 80 Marks)

11. (a) i) Estimate the voltage across A and B in the circuit shown inFig. CO1-U (8)

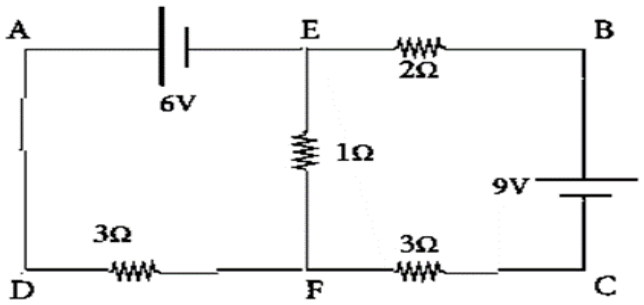


(ii) Determine the power dissipation in the 4Ω resistor of the given circuit shown in fig. using mesh/nodal analysis. CO1-U (8)



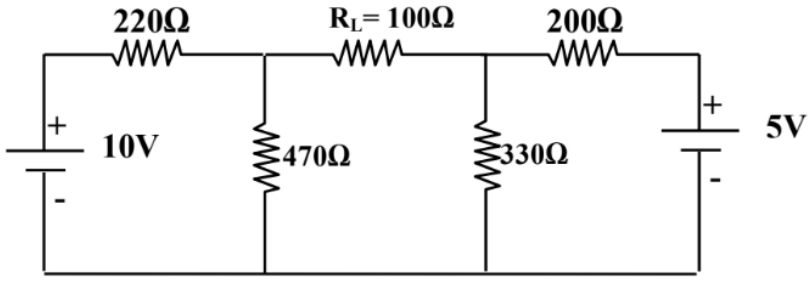
Or

(b) (i) Calculate the current that flows in the 1 Ω resistor in the following circuit by using kirchoff's laws. CO1-U (8)



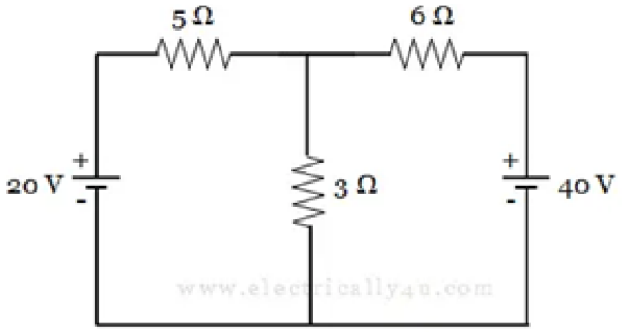
(ii) An inductor coil having a resistance of 10 Ω and inductance of 50 mH is connected to a 220 V, 50 Hz supply. Calculate the current, real power, reactive power, and apparent power. Draw the power triangle. CO1-U (8)

12. (a) Obtain the Norton's model and find the maximum power that can be transferred to the 100Ω load resistance in thecircuit shown in figure. CO2-App (16)

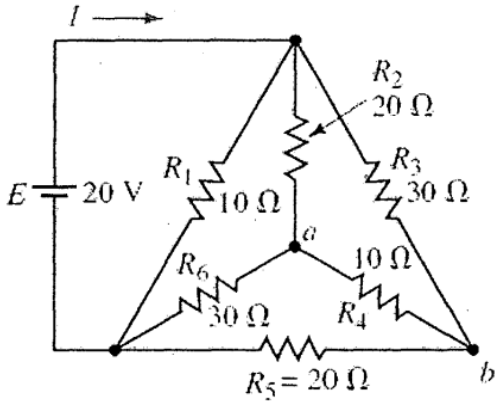


Or

(b) (i) Apply superposition theorem to determine current through 3Ω resistor for the given circuit in figure. CO2-App (8)



(ii) Determine the current I using network reduction technique. CO1-U (8)



13. (a) In series RLC circuit has a sinusoidal input voltage of maximum value 12 V. If inductance L = 20 mH, resistance R = 80 Ω and capacitance C = 400 nF, determine: CO1-U (16)

(i) the resonant frequency,

(ii) the value of potential difference across the capacitor at the resonant frequency,

(iii) the frequency at which the potential difference across the capacitor is a maximum,

(iv) the value of maximum voltage across the capacitor.

Or

(b) Consider an RL circuit with R=100 ohms and L=10 mH. The circuit is connected to a DC voltage source of 10V. Initially, the switch was open, and there was no current flowing through the circuit. At t=0, the switch is closed. Calculate the maximum current that flows through the circuit, the voltage across resistor, the voltage across the inductor and the time it takes for the current to reach 63.2% of its maximum value. CO1-U (16)

14.	(a)	i)	Sketch the basic construction of PMMC instrument. Develop the torque equation for a PMMC instrument and show that its scale is linear if spring control is employed.	CO1-U	(10)
		ii)	Discuss briefly the constructional features of an induction type energy meter.	CO1-U	(6)
			Or		
	(b)	i)	Illustrate with neat diagram the construction and working principle of attractive and repulsive type moving iron instrument?	CO1-U	(10)
		ii)	Explain the special features incorporated in an electrodynamometer type ofwattmeter so that it can be used for low power factor applications.	CO1-U	(6)
15.	(a)	i)	Interpret the principles and applications of different types of earthing systems used in domestic buildings.	CO1-U	(8)
		ii)	Explain in detail about the principle of Residual current circuit breakers.	CO1-U	(8)
			Or		
	(b)		Prepare the safety precautions followed while handling medical equipment in hospitals.	CO1-U	(8)