



P.E.S. College of Engineering, Mandya - 571 401
 (An Autonomous Institution affiliated to VTU, Belagavi)
Second Semester, B.E. - Semester End Examination; Sep. / Oct. - 2023
Elements of Electrical Engineering
 (Electrical and Electronics Engineering Stream)

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of mathematics & electrical laws to solve problems related to electrical circuits.

CO2: Analyze single phase and three phase AC systems to obtain desired expressions.

CO3: Describe the construction and working of DC-AC Machines & transformer.

CO4: Explain the concepts of electricity billing, circuit protective devices and personal safety measures.

Note: I) PART - A is compulsory. Two marks for each question.

II) PART - B: Answer any Two sub questions (from a, b, c) for a Maximum of 18 marks from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
1 a.	State Ohm's law.	2	L1	CO1	PO1
b.	Define RMS value and form factor of an alternating quantity.	2	L1	CO2	PO2
c.	Three, 100 Ω resistors are connected in star connection across 415 V, 50 Hz, 3 phase supply, calculate line current.	2	L1	CO1	PO2
d.	Mention any two applications of D.C Motors.	2	L1	CO1	PO1
e.	Define fusing factor.	2	L1	CO1	PO1
II : PART - B		90			
UNIT - I		18			
2 a.	i) State and explain Kirchhoff's current law and Kirchhoff's voltage laws.	5	L1	CO1	PO1
	ii) The current in 6 Ω resistance shown in below figure is 2 A. Find currents in all the other branches and supply voltage.				
		4	L2	CO1	PO1
b.	Define self-inductance and mutual inductance. Define co-efficient of coupling and establish the relation between self-inductances, mutual inductances with coefficient of coupling.	9	L1	CO1	PO1

- c. i) Derive an expression for energy stored in Inductance of 'L' henry. 5 L2 CO1 PO1
- ii) Two incandescent lamps rated 40 W and 80 W, each designed to work on 200 V are connected in parallel. Find current drawn from the source. If the lamps are connected in series across same supply, what is the current drawn? 4 L2 CO1 PO1

UNIT - II

18

- 3 a. i) Define power factor. Mention two disadvantages of low power factor. 9 L1 CO2 PO2
- ii) Define RMS Value of an AC current and derive its expression. 9 L2 CO2 PO2
- b. With the help of suitable equations, show that power consumed by an RC circuit is $P = VI \cos \phi$. Also draw current, voltage and power curves. 9 L2 CO2 PO2
- c. Find the total current, branch currents and the total power consumed in the circuit shown in Fig. 2C 9 L3 CO2 PO2

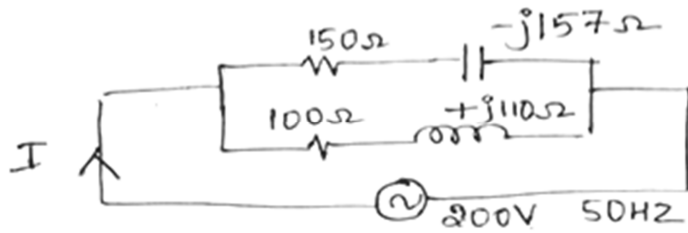


Fig. 2C

UNIT - III

18

- 4 a. Explain the wattmeter method of measurement of three phase power. 9 L2 CO1 PO1
- b. i) Obtain the relation between line and phase values of voltage and current in a balanced delta connected load. 6 L3 CO2 PO1
- ii) A balanced delta connected load is shown in Fig. 3(b), supply voltage is 415 V at 50 Hz. Calculate line and phase currents. 3 L2 CO2 PO1

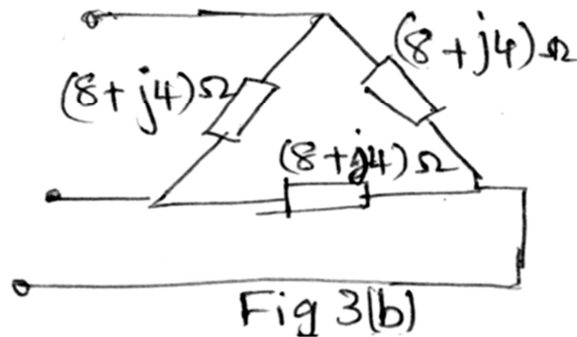


Fig 3(b)

- c. i) Mention any three merits of three phase system over single phase system. 3 L3 CO2 PO1
- ii) Three coils each having a resistance of 10 Ω and an inductance of 0.02 H are connected in star across 440 V, 50 Hz, 3 phase supply, calculate the line current and total power consumed. 6 L2 CO2 PO2

UNIT - IV**18**

- 5 a. Explain the two types of rotor in a synchronous generator, with neat sketches. 9 L2 CO3 PO2
- b. With a neat sketch, explain the construction of DC motor. 9 L5 CO3 PO2
- c. i) Derive an expression for torque developed in a DC motor. 5 L2 CO3 PO2
- ii) A 4 pole, 1500 rpm D.C. generator has a lap wound armature, having 32 slots and 8 conductors per slot. If the flux per pole is 0.04 Wb, calculate the emf induced in armature, what would be the emf induced, if winding is wave connected? 4 L2 CO1 PO1

UNIT - V**18**

- 6 a. i) With a neat diagram, explain the working of Earth Leakage Circuit Breaker [ELCB]? 5 L1 CO4 PO2
- ii) Mention four differences between fuses and circuit breakers. 4 L2 CO4 PO2
- b. i) What is electric shock? Mention precautions to be taken to prevent electric shock. 4 L3 CO4 PO1
- ii) What is earthing? Explain the plate earthing with a sketch. 5 L3 CO4 PO2
- c. I) Explain two parts electricity tariff. 5 L1 CO4 PO2
- II) Calculate the electricity bill amount for a month of 31 days, if the following devices are used as product.[Given: Rate of electricity per unit = Rs.2]
- i) 3 bulbs of 30 watts for 5 hours 4 L2 CO4 PO2
- ii) 4 tube lights of 50 watts for 8 hours
- iii) 1 fridge of 300 watts for 24 hours

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