

Code: 9A14301

B.Tech II Year I Semester (R09) Supplementary Examinations June 2017

ELECTRICAL ENGINEERING

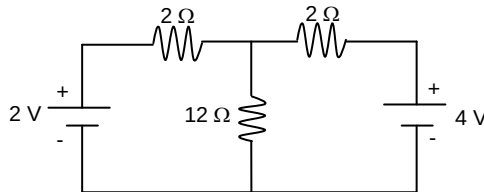
(Mechatronics)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 (a) State and explain Ohm's law.
(b) By taking any one example, state and explain Kirchhoff's laws.
- 2 (a) Explain in detail the types of elements.
(b) Using superposition theorem, determine the current through $12\ \Omega$ resistor (all resistances are in Ω) as shown in figure below:



- 3 (a) Show that the power dissipated by a pure capacitor excited by a sinusoidal voltage source is zero.
(b) A series circuit consisting of a $10\ \Omega$ resistor, a $100\ \mu\text{F}$ capacitance and a $10\ \text{mH}$ inductance is driven by a $50\ \text{Hz}$ AC voltage source of maximum value $100\ \text{V}$. Calculate the equivalent impedance, current in the circuit, the power factor and power dissipated in the circuit.
- 4 (a) Explain the constructional details of transformer.
(b) A single phase transformer working at unity power factor has an efficiency of 90% at both one half loads and at the full load of $500\ \text{W}$. Determine the efficiency at 75% of full load.
- 5 (a) Derive the e.m.f equation of DC generator.
(b) The armature of a 2-pole, $220\ \text{V}$ Lap wound generator has 400 conductors and runs at $300\ \text{rpm}$. Calculate the useful flux/pole, if the number of turns in each field coil is 1200.
- 6 (a) Explain the losses that occur in a DC machine.
(b) A 4-pole, shunt motor has 472 wave connected armature conductors. The flux per pole for a field current of $2\ \text{A}$ is $36\ \text{mWb}$ and for $4\ \text{A}$ is $42\ \text{mWb}$. The field resistance is $125\ \text{ohm}$. Calculate the no-load speed of the motor with a terminal voltage of $500\ \text{V}$.
- 7 (a) Explain the principle of operation of 3-phase induction motor.
(b) A 6 pole, 3- ϕ induction motor runs at $1140\ \text{rpm}$ on full load when supplied from a $60\ \text{Hz}$ supply. Determine the synchronous speed and slip at full load.
- 8 (a) Explain the essential features of measuring instruments.
(b) Explain the principle and operation of moving iron meters with neat diagram.
