Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent Institution of MAHE, Manipal)

II SEMESTER B.TECH

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: BASIC ELECTRICAL TECHNOLOGY [ELE 1001]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 23rd April 2018** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. For the circuit shown in Fig. 1A, determine the resistance between A and B. ***(03)***

1B. In the network of Fig. 1B, find the current through 4 Ω resistance using mesh current analysis. ***(03)***

1C. In the circuit of Fig. 1C, find V_1 and V_2 using node voltage analysis. ***(04)***

2A. A capacitor of 8 μF is charged to a DC voltage of 60 V. It is then discharged through a resistance of R Ω. The voltage across the capacitor after 25 m-sec is 30 V. Calculate the (i) value of R (ii) value of current. ***(03)***

2B. Two coupled coils are connected in series. The equivalent inductances are 0.6 H and 0.4 H depending on the relative directions of currents in the two coils. If the self-inductance of one of the coil is 0.15 H, determine the (i) self-inductance of the other coil (ii) mutual inductance (iii) Coefficient of coupling (iv) induced emfs in the two coils when they are connected in series – aiding if a current of 1.8 A is reversed in 0.01 seconds. ***(03)***

2C. A magnetic circuit is arranged as shown in Fig. 2C. Length of air gap = $2.3 * 10^{-3}$ m, area of cross section = $1.8 * 10^{-3}$ m^2, relative permeability of iron = 1100. A coil of 83 turns carrying a current of 1.5 A is uniformly wound on the circuit. Determine (i) reluctance of iron path and air gap (ii) flux in the iron path (iii) flux linkage in the coil. ***(04)***

3A. Two impedances $Z_1 = 3\angle 45°$ Ω and $Z_2 = (4 - j2.5)$ Ω are connected in series across a single phase alternating voltage source. The voltage across Z_1 is $27.28\angle -5.62°$ V. Find (i) Voltage V_2 across second impedance (ii) Applied voltage V (iii) Overall circuit power factor. ***(04)***

3B. An impedance of (5 + j10) Ω is connected in parallel with a resistance 25 Ω and the combination is supplied from 230 V, 50 Hz, single phase AC supply. Calculate (i) Combined admittance of the circuit (ii) Total active and reactive power (iii) Value of capacitance to be connected in parallel to improve the overall power factor to unity. ***(04)***

3C. A circuit having a resistance of 10 Ω, inductance of 0.4 H and a variable capacitance in series is connected across an 110 V, 250 Hz supply. Calculate (i) The value of capacitance for the circuit to be resonant at the supply frequency (ii) Voltage across the inductance ***(02)***

4A. Three similar impedances, each of (12 – j8) Ω, are connected in delta across a 400 V, 50 Hz, 3 phase AC supply. Determine (i) phase current (ii) line current (iii) Active, reactive and apparent powers (iv) readings of the two wattmeters connected to measure the power. ***(04)***

4B. Three impedances, $Z_R = (8 + j6)\ \Omega$, $Z_Y = 12\ \underline{/-40^o}\ \Omega$ and $Z_B = (16 - j12)\ \Omega$ are connected in star across a 200 V, 50 Hz, 3 phase, 3 wire, RYB supply. Determine the line currents. ***(04)***

4C. With usual notations, derive the relation between the line and phase voltages in a 3 phase, star connected, balanced load connected to a 3 phase, balanced, 3 phase ac supply. Draw the complete phasor diagram. ***(02)***

5A. Explain the working principle of a 3 phase Induction motor. ***(03)***

5B. With neat sketches, explain the construction of a DC Motor. ***(04)***

5C. With a relevant sketch, explain the operation of an ideal Transformer when the load is connected. ***(03)***

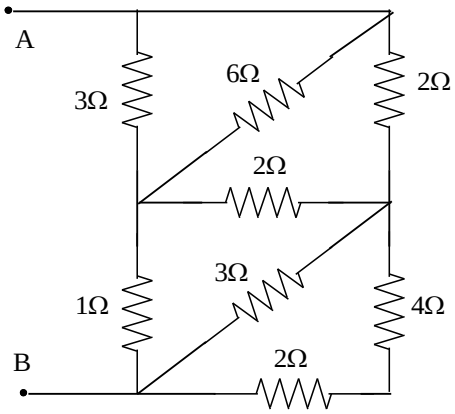

Fig. 1A

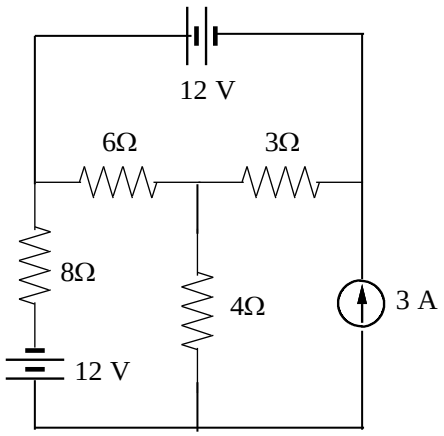

Fig. 1B

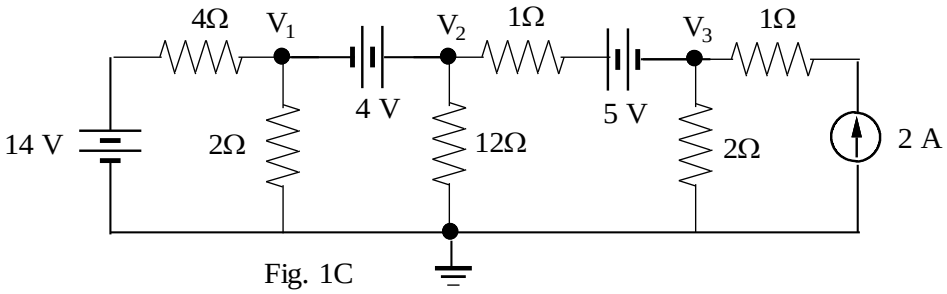

Fig. 1C

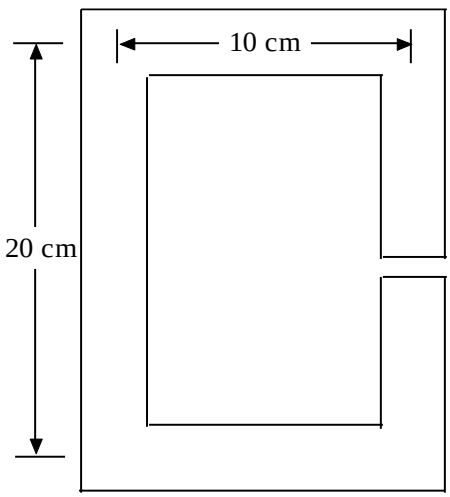

Fig. 2C