

Reg. No.....

Name.....

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2016**  
**BE101-03 INTRODUCTION TO ELECTRICAL ENGINEERING**

Max. Marks: 100

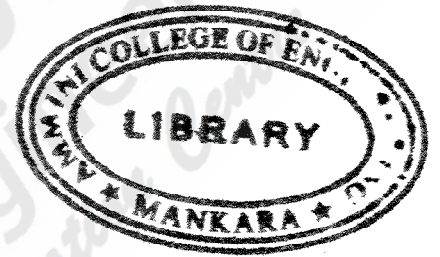
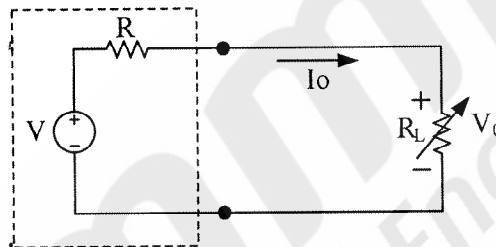
Duration: 3 Hours

*Instructions: Make suitable assumptions if any data is missing*  
*Write units in all numerical answers*

**PART- A**

*(Answer all Questions. 10x4 = 40 marks)*

- 1 Identify and explain the source given in the figure below within the dotted line. (4)  
 Given  $V=1.5V$  and  $R=1\Omega$ , find the value of current  $I_0$  and voltage  $V_0$  across  $R_L$  for the following values of  $R_L = 0.1, 0.5$  and  $1.0 \Omega$ .



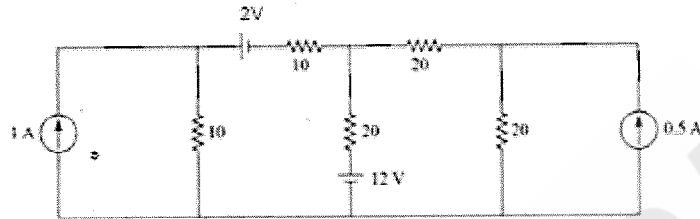
- 2 List a few similarities and dissimilarities of magnetic and electric circuits. (4)
- 3 A 50 cm long conductor moves with a velocity of 2 m/s at right angles to itself and a uniform magnetic field of  $1Wb/m^2$  flux density. Calculate the voltage induced between the ends of the conductor. What will be the voltage if the conductor is moving at  $30^\circ$  from the direction of the flux? (4)
- 4 A capacitor of capacitance  $79.5 \mu F$  is connected in series with a non-inductive resistance of  $30 \Omega$  across 100 V, 50 Hz supply. Find (i) impedance (ii) current (iii) phase angle and (iv) equation for instantaneous value of current. (4)
- 5 The voltage across  $150 \Omega$  resistor is  $150 \sin(2\pi \times 10^3 t)$  V. At what value of 't' does the current through the resistor equal to  $-0.26$  A and what is instantaneous power at this time t? (4)
- 6 What is resonant frequency? Give a graphical explanation of series resonance in series RLC circuits. (4)
- 7 What are the advantages of three phase system over single phase system? (4)
- 8 How do you measure 3phase reactive power in a balanced 3 phase system using one Wattmeter? (4)
- 9 What is the role of a MCB in domestic wiring circuit? Also explain the working of MCB (4)

- 10 Explain the necessity of earthing in electrical appliances (4)

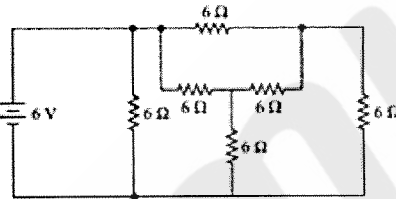
**PART- B**

*Answer any four full Questions*

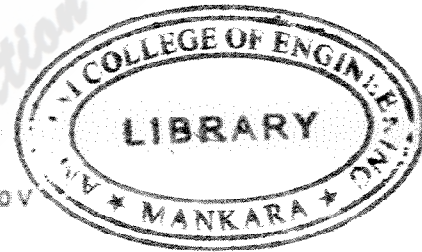
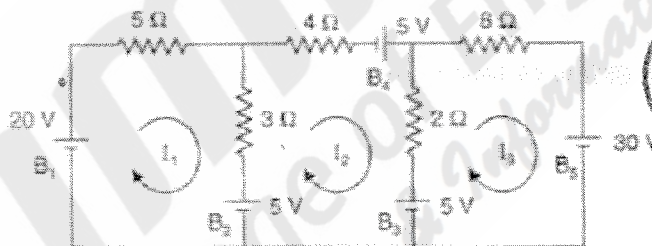
- 11 a. Using Nodal Analysis find the currents flowing through the various branches in the circuit shown in figure below. (6)



- b. Calculate the current supplied by the battery in the circuit shown in figure below (4)

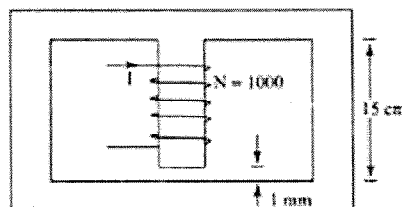


- 12 a. Using mesh analysis, determine the current supplied by each battery in the circuit shown in figure. (6)

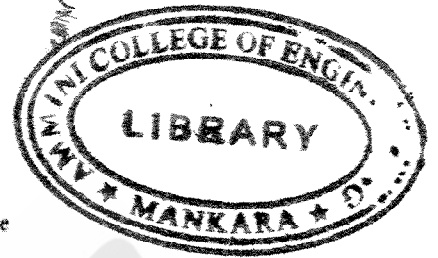
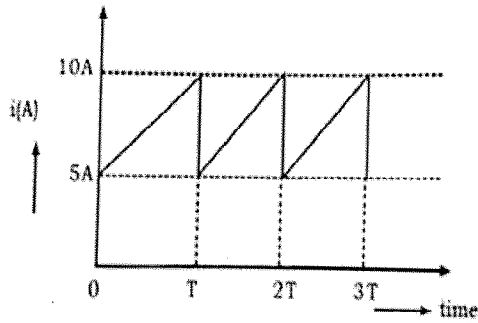


- b. Drive the expression for coefficient of coupling (K) between two magnetically coupled circuits. (4)

- 13 Calculate the current required to be passed through the central limb winding so as to produce a flux of 1.6 mWb in this limb. Length of iron in the central limb is 15 cm. Cross sectional area of the central limb is 8 cm<sup>2</sup> and that of outer limbs 4 cm<sup>2</sup>. The mean length of iron of the outer limb is 32 cm each. Given that for iron, for a flux density of 2.0 Wb/m<sup>2</sup>, the value of H is 800 AT/m. (10)



- 14 Find the average value and r.m.s value of the waveform given below. (10)



- 15 a. Explain how sinusoidal voltages and currents are represented as phasor? (4)
- b. A Coil of resistance  $50 \Omega$  and inductance  $100 \text{ mH}$  is connected in series with a capacitor of  $500 \mu\text{F}$  is connected across a  $230 \text{ V}$ ,  $50 \text{ Hz}$  ac supply. Find (i) Current through the coil (ii) Power consumed (iii) Reactive power and (iv) Voltage across the coil. Also draw the phasor diagram with voltage as the reference vector. (6)
- 16 a. Prove the instantaneous power consumed by a pure capacitor is zero. (4)
- b. A series LCR circuit which resonates at frequency  $500 \text{ kHz}$  has  $L=100 \mu\text{H}$ ,  $R=25\Omega$  and  $C=1000 \text{ pF}$ . Determine (i) the Q-factor of the circuit (ii) the new value of C required to resonate at  $500 \text{ kHz}$  when the value of L is doubled and the new Q factor. (6)

### PART- C

*Answer two full Questions (17 or 18 and 19 or 20)*

- 17 a. Derive the relation between Line and Phase Values of Voltage and Current for a delta connected system. (4)
- b. The load to a three phase power supply consists of three similar coils connected in star. The line currents are  $25\text{A}$  and the kVA and kW inputs are  $20$  and  $11$  respectively. Find (i) the phase and line voltages (ii) the reactive power input (iii) the resistance and reactance of each coil. (6)

**OR**

- 18 a. What is meant by phase sequence of a 3 phase system? (3)
- b. Three identical coil having resistance of  $10 \Omega$  and an inductance  $38.2 \text{ mH}$  are connected in delta across  $400 \text{ V}$ , 3 phase  $50 \text{ Hz}$  supply. Find wattmeter reading if two Wattmeter method is used to measure total power. (7)
- 19 With a neat sketch explain plate earthing indicating standard dimensions. (10)

**OR**

- 20 a. If an earth leakage is occurred in a domestic installation, which protective device will act? Explain the working of that device. (5)
- b. Give the schematic Layout of an LT Switch Board. (5)