BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FIRST YEAR FIRST SEMESTER
SUPPLEMENTARY EXAM – 2018

Subject: PRINCIPLES OF ELECTRICAL ENGINEERING-I

Time: Three Hours   Full Marks: 100

Use separate Answer script for each part
PART-II (50 marks)
Answer any Three Questions
(Q. No. 1 carries 18 marks)

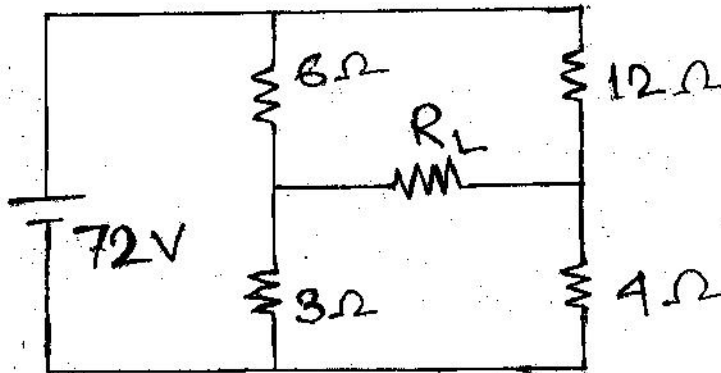1. a) Define biot (Bi). Find the dimensions of Electric Potential (V) and Magnetic Flux (Φ) in emu unit system.

    2+4=6

   b) A circuit consists of resistance R, and capacitive reactance Xc and connected across $115V, 50\,Hz$ supply and takes $0.8A$ current at a power factor of 0.3 leading. Find the value of R and Xc.

    6

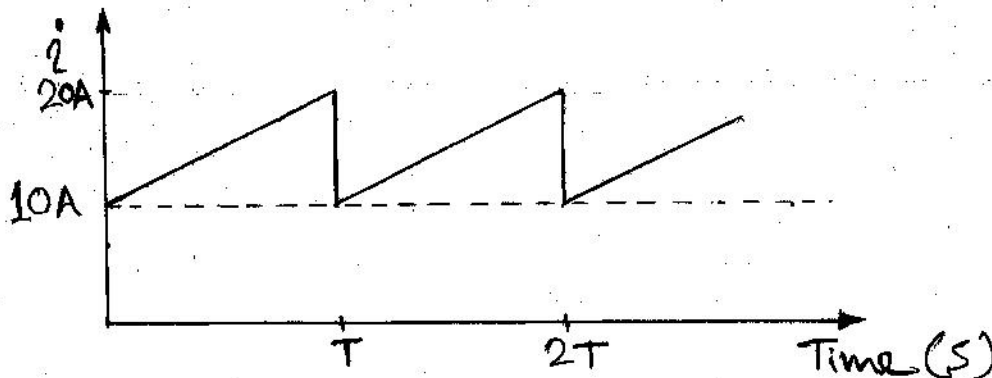   c) Find the Thevenin's equivalent network for given the network.

    6

2. a) State and explain the Superposition Theorem. Find the dimensions of i) CR^2 & ii) $\frac{L}{R}$ in MKS unit system.

    4+4=8

   b) Find the $r.m.s.$ and $average$ value of current wave as shown below-

    8

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3. a) Discuss the effect of varying frequency upon the current drawn and power factor in a RLC series circuit.

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b) Show that a non-ideal current source can be replaced by a non-ideal voltage source with similar V-I characteristics.

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c) In the below network, the voltage across terminals a & b is $200V$ (when they remain opened). When a & b are shorted, the current flowing through sorting is $10A$. i) Find the value of resistance that should connected across a & b, so that $5A$ current flowing through that resistance. ii) Find the value of the resistance such that power delivered to the resistance is maximum. iii) Also find the maximum power that can be transferred to the resistance calculated in ii).

8
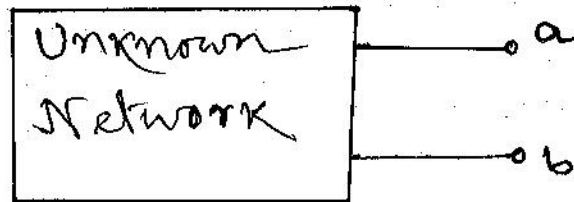
4. a) Derive the $r.m.s.$ and $average$ value of the Half Wave Rectified current.

8

b) An alternating current varying sinusoidally with a frequency of 50 Hz. It has a r.m.s. value of $10A$. Write down the equation for the instantaneous value and find this value for i) $0.0025\ sec$, ii) $0.125\ sec$ after passing through a positive maximum value. At what time measured from a positive maximum value, will the instantaneous current be $7.07A$.

8

5. a) Show that the power consumed by a pure capacitor over a full cycle of applied sinusoidal voltage is zero.

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b) A coil of resistance 50Ω and inductance $0.12H$ is connected in series with a capacitance of $80\mu F$ across $230V, 50Hz$ supply. Calculate i) the current in the circuit, ii) the potential differences across each element and iii) the frequency at which the current would have unity power factor.

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c) For a RLC series circuit, discuss the nature of power factor for i) $X_L > X_C$ and ii) $X_L < X_C$ with suitable phasor diagram.

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