SVKM's NMIMS

Mukesh Patel School Of Technology Management & Engineering

Program: B.Tech- All streams Year: I Trimester: I

Academic Year : 2012-2013

Subject: **Basic Electrical Engineering** Marks: 100

Time: 2.00 pm To 5.00 pm

Date: 29/10/2012 Duration: 3 hrs.

Final - Examination

Instructions: Candidates should read carefully the instructions provided on the question paper and on the cover of the answer book which is provided for their use.

NB:

1. Question no. **1** is compulsory.
2. Out of the remaining questions, attempt any **FOUR**.
3. In all **FIVE** questions to be attempted.
4. Figure in brackets indicate full marks.

Q.1. Attempt any four of the following. [20]

a) State and explain the following theorems: 1) Norton's theorem
2) Maximum power transfer theorem

b) It is required to operate a geyser of 2KW. At an initial temperature of 20°C, a voltage 200V is necessary. After some time, a voltage of 225V is necessary to maintain the same power. Estimate the temperature attained by the coil. Assume $\alpha o = 0.006/°C$.

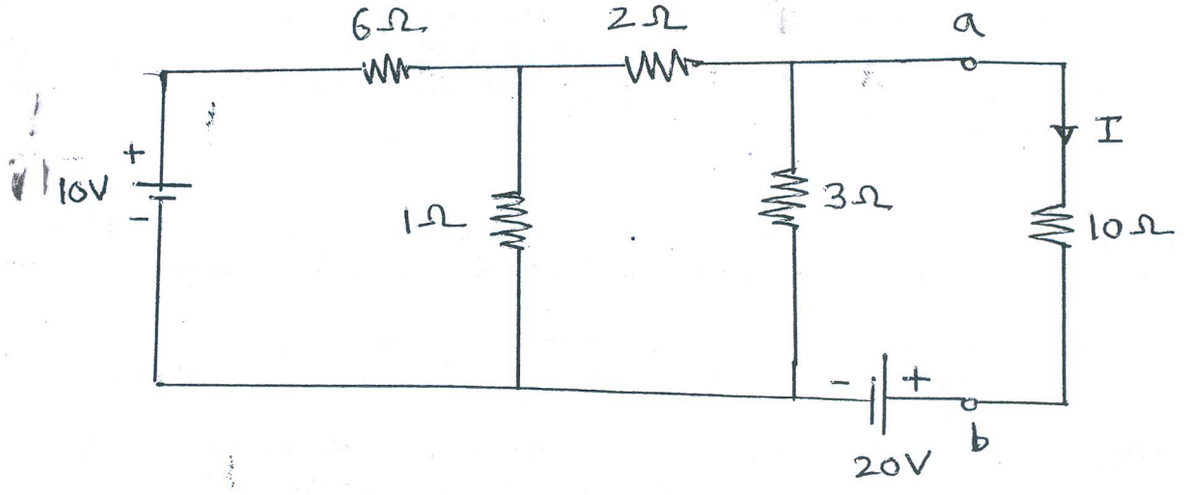
c) Derive the equation for the average and rms values of a half wave rectified voltage waveform.

d) Derive the emf equation of a single phase transformer.

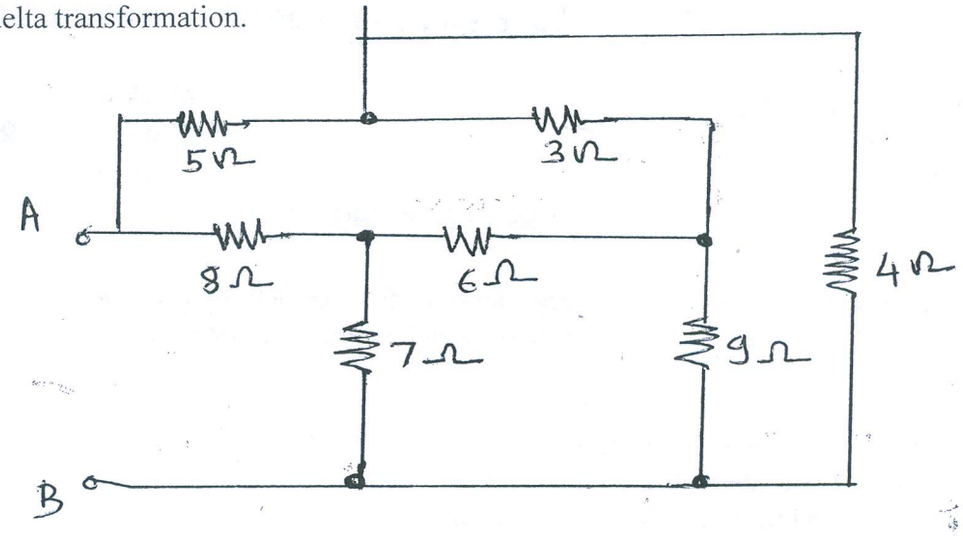
e) A capacitor is charged from a dc source through a resistor of 500KΩ. If the voltage across the capacitor reaches 75% of its initial value in 0.5 sec, find the capacitance.

Q.2.

a) In the figure given below, replace the network to the left of the terminals a-b by its Thevenin's equivalent circuit and hence find current I. [10]

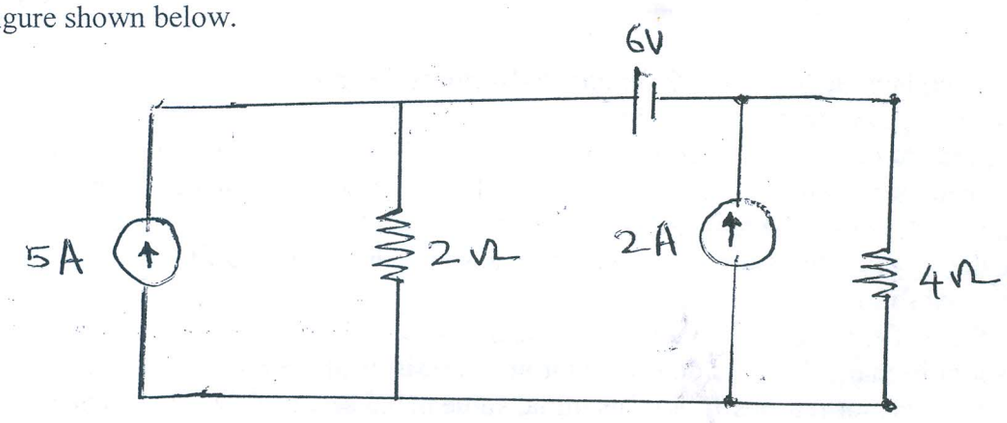


b) Find the equivalent resistance between terminals A-B of the network shown using star-delta transformation. [10]



Q.3.

a) Find the current in the 4Ω resistance using Superposition theorem for the figure shown below. [10]



b) An ac circuit consists of a pure resistance and an inductive coil connected in series. The power dissipated in the pure resistance and in the coil are 1000W and 200W respectively. The voltage drops across the resistance and the coil are 200V and 300V respectively. For this circuit, draw a neat diagram indicating all the relevant parameters, and calculate [10]

1) value of the pure resistance
2) current through the circuit
3) resistance of the coil
4) reactance of the coil
5) impedance of the coil
6) total impedance of the circuit
7) supply voltage

Q.4.

a) A series RLC circuit with a resistance of 10 Ω, inductance of 0.2 H and a capacitance of 40 μF is supplied with a 100V ac supply. Find the following with respect to the series resonant circuit: [10]

1) the frequency at resonance
2) current
3) power
4) power factor
5) voltage across R, L & C
6) quality factor of the circuit

b) Derive the relation between line and phase quantities for a 3 phase balanced star connected load. Draw the complete phasor diagram for a lagging power factor load. [10]

Q.5.

a) A load test is conducted on a 2 KVA, 220 V/110 V, 50 Hz single phase transformer using resistive load. Following are the results obtained at a particular load condition: [10]

Primary side			Secondary side		
V_1	I_1	W_1	V_2	I_2	W_2
220 V	4.5A	866W	102V	8A	-

If the no-load secondary voltage is 108V, calculate the efficiency and regulation of the transformer at the given load condition.

b) Derive the expression for the energy stored in an inductor. [10]

Q.6.

a) An iron ring has a cross-section of 3 cm^2 and a mean diameter of 25 cm. An air-gap of 0.4mm has been cut across the section of the ring. The ring is wound with a coil of 200 turns through which a current of 2A is passed. If the total magnetic flux is 0.24 mWb, find the relative permeability of iron. [10]

b) State and explain Steinmetz Law. Calculate the energy lost per second by hysteresis in an iron armature weighing 50.86 kg , the frequency being 50Hz, flux density being 0.3 Wb/m^2, the hysteresis coefficient being 376.8 J/m^3 and the density of the armature iron being 7.75. [10]

Q.7. Write short notes on the following: [20]

a) Resonance in parallel ac circuits

b) Open Circuit and Short Circuit tests of a transformer
