SEM 1 – 4 (RC 07 – 08)

F.E. (Semester – I) (RC 2007-08) Examination, Nov./Dec. 2016

BASIC ELECTRICAL ENGINEERING

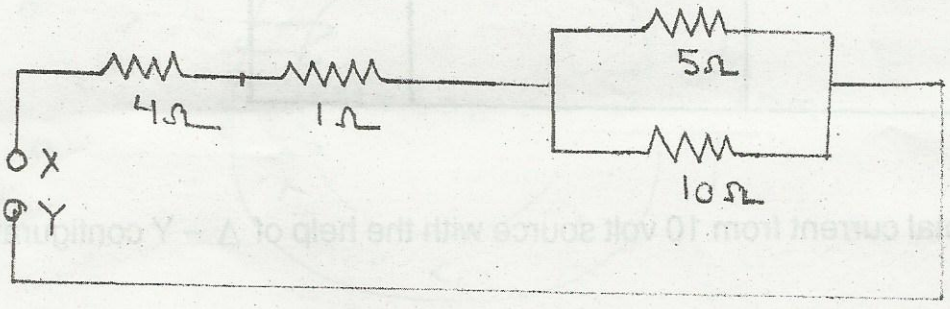
Duration : 3 Hours | Total Marks : 100

Instructions: *1) Answer **any five** questions atleast **one** question from **each** Module.*

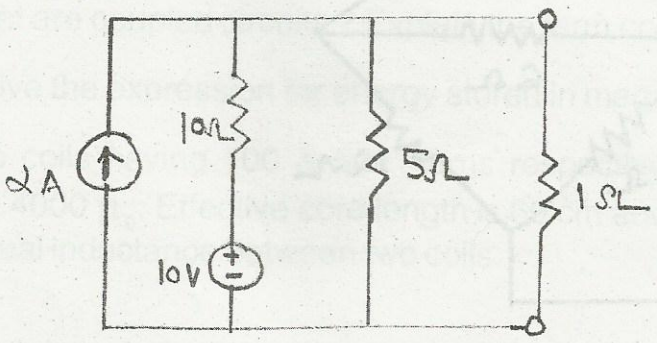
*2) **Assume** suitable data if necessary.*

MODULE – I

1. a) Determine the voltage that must be applied at X – Y terminal such that voltage across 4Ω resistor is 5V. 7



b) Find the powerloss in the 1Ω resistor by using Thevenin's theorem for following circuit. 6



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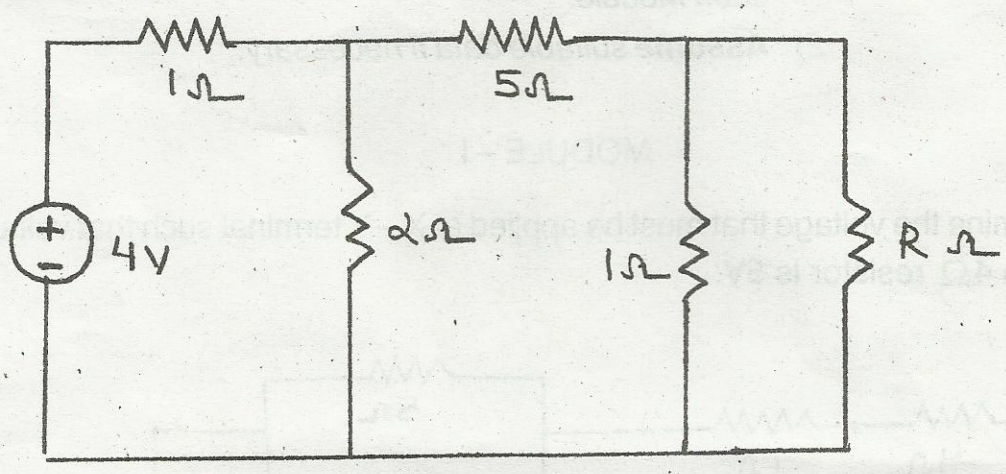
c) Find the equivalent inductance when three inductances are connected :

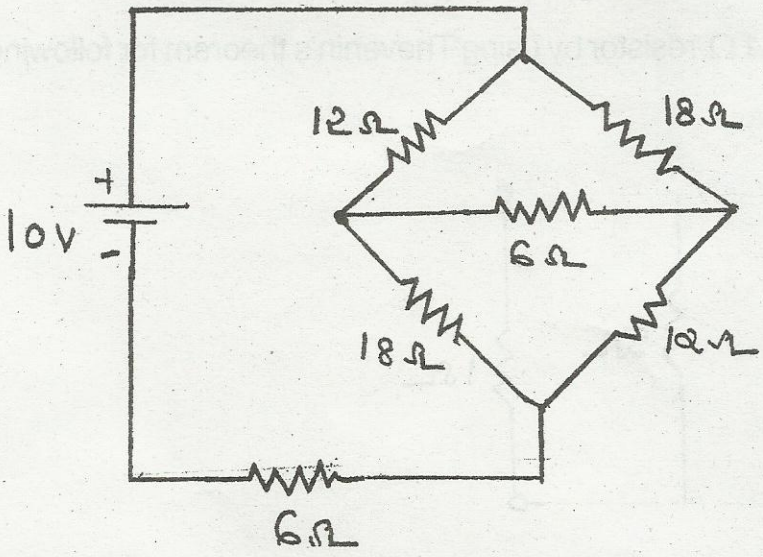
i) Series ii) Parallel

2. a) State and prove maximum power transfer theorem for DC circuits.

b) Find the value of R in circuit such that maximum power transfer takes place. What is the amount of this power ?



c) Find the total current from 10 volt source with the help of Δ – Y configuration. **8**

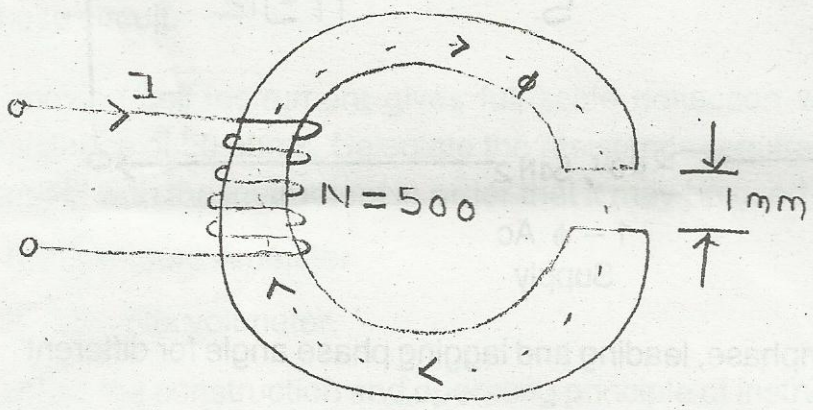


MODULE – II

3. a) Derive an expression for total MMF induced in series circuit with an airgap. 6

   b) State Amperes law, explain its significance and application. 6

   c) A wrought iron bar 30 cm long and 2 cm in diameter is bent into circular shape as shown in figure, an airgap of 1mm is cut across one of its limb. Area of cross section of core is $\pi \times 10^{-4}$ m^2. Calculate the excitation current of the coil, having 500 turns, to produce flux of 0.5 mwb. The relative permeability $\mu_r = 4000$. 8



4. a) An electromagnet has an airgap of 4 mm and flux density in the gap is 1.3 wb/m^2. Determine the ampere-turns for the gap. 4

   b) What are coupled circuits ? Explain the term coefficient of coupling. 6

   c) Derive the expression for energy stored in magnetic field. 6

   d) Two coils having 100 & 500 turns respectively are wound on core with $\mu = 4000\ \mu_0$. Effective core length is 60 cm and core area is 9 cm^2. Find mutual inductance between two coils. 4

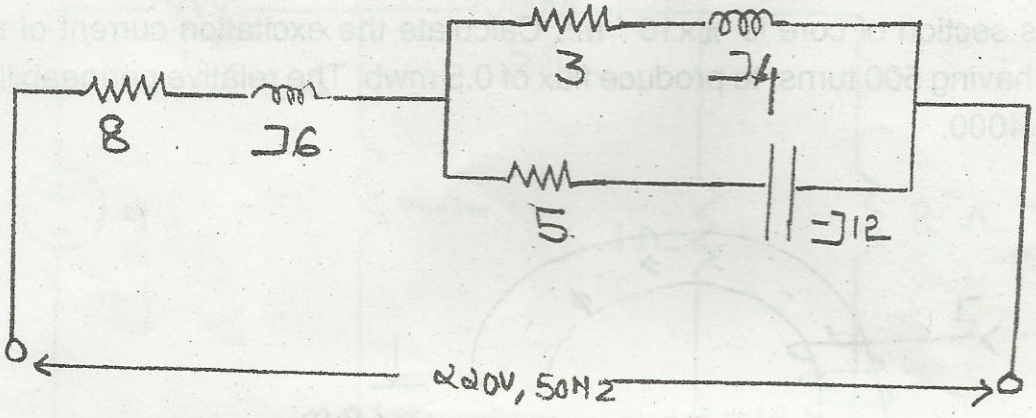
MODULE – III

5. a) Determine the following for circuit. 7

i) Total circuit current

ii) Total active power

iii) Power factor of circuit.



1 – ϕ Ac
Supply

b) Explain concept of inphase, leading and lagging phase angle for different loads. 5

c) A three phase four wire 400 volts (L to L) system supplies a balanced star connected load having impedance of 20 L – 30 ohms in each phase. Find line currents. How much current is flowing through neutral. 8

6. a) Draw a phasor diagram showing following voltages $V_1 = 200 \sin 500t$, $V_2 = 300 \sin (500 t + 45)$, $V_3 = 400 \cos 500 t$. Find rms value of resultant voltage. 6

b) Derive relationship between current and voltage in a pure inductive and pure capacitive circuit. Draw the waveforms of instantaneous values of voltage and current. 7

c) Two impedances $Z_1 = 10 + J5$ and $Z_2 = 8 + J6$ are connected in parallel across voltage of $V = 200 + J0$. Calculate circuit current, power factor, reactive power, active power. 7

MODULE – IV

a) A 500 KVA, 11000/400 V, 50 Hz, single phase transformer has 100 turns on the secondary winding calculate : 7

i) Number of turns on prim wdg.

ii) Primary and secondary currents

iii) Maximum value of flux in core.

b) Explain with equations how primary current changes, when load current is set up in the secondary winding of transformer. 6

c) Explain the method of measurement of power for unbalanced load in three phase circuit. 7

3. a) A moving coil instrument gives full scale deflection with 10 mA and has resistance of 50 ohms. Calculate the resistance required to put in series/ parallel with the instrument in order that it may be used as : 6

i) 10 Ampere Ammeter

ii) 100 volts voltmeter.

b) Explain the construction and operating principle of instrument which can be used for measurement of Ac voltage. 6

c) A single phase 3300/400 V transformer has following winding resistances and reactances $R_1 = 0.7\Omega$, $R_2 = 0.011\ \Omega$, $X_1 = 3.6\Omega$, $X_2 = 0.45\Omega$. The secondary is connected to load having resistance of 4.5Ω and inductive reactance of 3.2Ω. Calculate secondary terminal voltage and power consumed by the load. 8