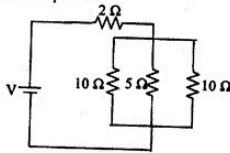Time : **3** Hours]   [Total Marks : **100**

Note :   Attempt **all** questions. All questions carry **equal** marks.

1. Attempt any **Four** Parts :   5×4=20
   (a) Define Resonance and Quality factor for the ac circuit.
   (b) State and explain the Theenin's theorem.
   (c) In the circuit shown below, determine the constant voltage V if the current in the 5 Ω resistor is 14 amperes.

   (d) Draw the phasor diagram, showing voltages and currents, if a sinusoidal voltage is applied to (i) R (ii) R-L (iii) R-C (iv) C-L (v) R-L-C circuits.
   (e) Explain the conversion of Current source to Voltage source and vice versa.
   (f) Explain the meaning of unilateral and bilateral elements.
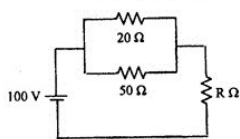
2018]   1   [Contd...

2   Attempt any **four** parts :   5×4=20

(a)   Determine the value of the resistance R shown below if the potential drop across it is 25 Volts.

(b)   An iron ring of mean length 50 cm has an air gap of 1 mm and a winding of 100 turns. If the relative permeability of iron is 300 and a current of 1 A flows through the coil. Calculate the flux density. Neglect fringing.

(c)   A rectangular coil of 1000 turns, when carrying a certain current produces a flux of 4.5 mWb. Calculate the average value of induced emf if this current through the coil is reversed in 100 milliseconds.

(d)   Explain the magnetization curve of a magnetic material. Properly label it.

(e)   Explain the Peak factor and Form factor in ac quantities

(f)   Explain the Real and reactive power in ac circuits

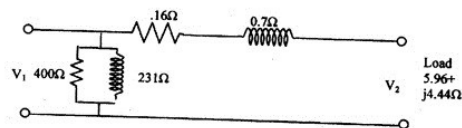3   Attempt any **two** parts :   2×10

(a)   Define the term Voltage Regulation in case of single phase transformers. Derive the condition for maximum voltage regulation.

(b)   The diagram shows the equivalent circuit for a single phase transformer. Figure given are of resistances and reactances in ohms in terms of the primary side. The ratio of secondary to primary turns is 10 and the load in inductive. Find : (a) the secondary terminal voltage; (b) the primary current; (c) the efficiency, if the applied voltage is 220 V.

(c)   What types of losses occurs in the transformer? Explain the methods to reduce them.

4   Attempt any **two** parts :   2×10

(a)   Explain the working principle of moving iron instruments.

(b)   Why starters are used to start an Induction motor? List all the methods could be adopted for starting an induction motor. Explain any one method.

(c)   What do you mean by damping torque? List all the methods to attain this torque and explain one of them.

5   Attempt any **two** parts :   2×10

(a)   Prove that torque in a D. C. motor is given by $T_e = K_a \phi I_a$, where all terms have their usual meanings.

(b)   Find the minimum number of poles for a 1200 kW generator if the average voltage between Commutator segments is not to exceed 15 V and the armature ampere turns per pole not exceed 10,000.

(c)   Explain the voltage buildup phenomena in a D.C. shunt generator.