Total No. of Questions : 12] **[Total No. of Printed Pages : 4**

[3761]-14

F. E. Examination - 2010

BASIC ELECTRICAL ENGINEERING

(2003 Course)

Time : 3 Hours] **[Max. Marks : 100**

Instructions :

*(1) Answer **three** questions from section I and **three** questions from section II.*

*(2) Answers to the **two sections** should be written in **separate books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket scientific calculator and steam tables is allowed.

(6) Assume suitable data, if necessary.

SECTION - I

Q.1) (A) Define Insulation Resistance and derive its expression for a Cable. **[06]**

(B) Write a short note on Nickel-Cadmium Cell. **[05]**

(C) A piece of silver has a resistance of 1Ω. What will be the resistance of manganin wire of one-third of the length and one-third the diameter if the resistivity of manganin is 30 times that of silver ? **[06]**

OR

Q.2) (A) An electric water heater raises the temperature of 20 liters of water from 16°C to 100°C. If the efficiency of the heater is 85%, calculate the energy consumed by the heater in (i) Joules (ii) in kwh. The sp. heat capacity of water is 4190 J/kgK. **[06]**

(B) Define and explain Work, Power and Energy. **[06]**

(C) Discuss the effect of temperature on the resistance of various materials. **[05]**

Q.3) (A) State and explain Kirchoff's Laws. **[06]**

(B) Derive the formulae to convert a delta connected network into its equivalent star connected network. **[06]**

(C) State and explain Maximum Power Transfer Theorem. **[05]**

OR

Q.4) (A) State Superposition Theorem and use it to calculate the current in branch X-Y of the circuit shown in fig. 1. **[12]**

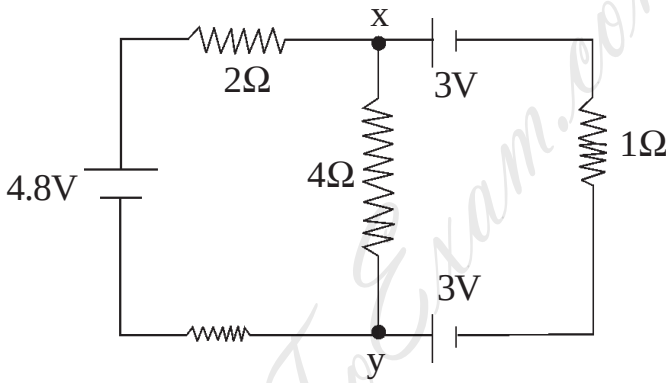

Fig. 1

(B) State and explain Thevenin's Theorem. **[05]**

Q.5) (A) Define and explain the following as related with Magnetic Circuit : **[06]**

(1) Magnetic Flux Density

(2) Permeability

(B) Write a short note on Magnetic Leakage and Fringing. **[06]**

(C) Explain Hysteresis Loss. **[04]**

OR

Q.6) (A) A magnetic core, in the form of a closed ring has mean length of 20 cm and cross section of 1 cm^2. The relative permeability of iron is 2400. Calculate the current which will be required in a coil of 2,000 turns uniformly wound on the ring to create a flux of 0.2 mwb in the iron. **[06]**

(B) State and explain Faraday's Laws of Electromagnetic Induction. **[06]**

(C) Define Self and Mutually Induced e.m.f. **[04]**

SECTION - II

Q.7) (A) Derive expression of Energy stored in Capacitor in terms of Capacitance and Voltage. **[06]**

(B) Derive the expression for Average Value of the Sinusoidally Varying Current in terms of its Peak Value. **[06]**

(C) An alternating current is given by i = 14.14 sin 377 t.

Find its –

(1) R.M.S. Value

(2) Frequency and sketch its Waveform. **[05]**

OR

Q.8) (A) Derive the expression for the RMS Value of the Sinusoidally Varying Current in terms of its Peak Value. **[06]**

(B) Define and explain :

(1) Form Factor and

(2) Peak Factor **[06]**

(C) Two capacitors of 8μF and 2μF are connected in series across a 400V d.c. supply.

Calculate :

(1) Resultant Capacitance

(2) p.d. across each capacitor **[05]**

Q.9) (A) A Coil of Resistance 15Ω and inductance 0.05H is connected in series with 100μF capacitor a cross a 230V, 50Hz supply. Find :

(1) Current Drawn

(2) Phase Angle

(3) Voltage Drop Across Coil and Capacitor **[08]**

(B) Two impedances $(8 + j6)\Omega$ and $(3 - j4)\Omega$ are connected in parallel across a.c. supply. If the total current drawn is 25 Amp then calculate current and power taken by each impedance. **[08]**

OR

Q.10) (A) Explain following terms :

(1) Active Power

(2) Reactive Power

(3) Admittance Triangle and

(4) Impedance Triangle **[08]**

(B) A 200V, 50 Hz single phase supply is connected to a load consisting of 50Ω resistance, 75 mH inductance of $500\mu F$ capacitance all in series. Calculate the current drawn. What will be new value of current if supply frequency is reduced to 25 Hz. **[08]**

Q.11) (A) Explain with neat connection diagram how direct load test is performed on single phase transformer to determine its regulation and efficiency. **[08]**

(B) Define :

(1) Phase Sequence

(2) Balanced Load

(3) Symmetrical Supply **[06]**

(C) State the equations for 3 phase active power, reactive power and apparent power. **[03]**

Q.12) (A) A 3300/250 50Hz Single Phase Transformer has cross sectional area of core of $125cm^2$ and 70 turns on low voltage side. Calculate :

(1) The value of maximum flux density.

(2) The no. of turns on high voltage side. **[05]**

(B) Derive the expression of Active Power in a Delta connected balanced load in a three phase circuit. Draw connection diagram and relevant phasor diagram. **[12]**
