May-June 2009

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

[3561]-103

F. E. (Semester - I) Examination - 2009

BASIC ELECTRICAL ENGINEERING

(June 2008 Course)

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

Instructions :

(1) Attempt Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 11 or 12.

*(2) Answer to the **two sections** must be written **separate answer-books**.*

(3) Figures to the right indicate full marks.

(4) Use of non-programmable pocket size scientific calculator is permitted.

(5) Neat diagrams must be drawn wherever necessary.

(6) Assume suitable data, if necessary.

SECTION - I

Q.1) (A) Define Insulation Resistance and obtain an expression for Insulation Resistance of a Single Core Cable. **[08]**

(B) Determine the current flowing at the instant of switching a 60 watt lamp on a 240 V supply. The ambient temperature is 24° C. The filament temperature is 2000° C and R.T.C. of a filament material is 0.005 per °C at 0°C. **[06]**

(C) Compare Lead Acid Cell and Nickel Cadmium Cell. **[04]**

OR

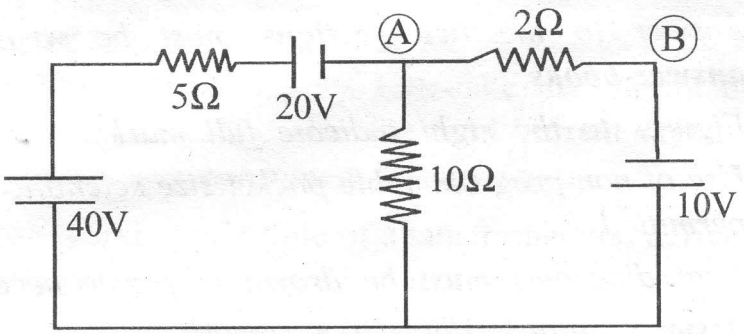
Q.2) (A) Write down chemical equations during charging of Lead Acid Battery. **[04]**

(B) If α_1 and α_2 are RTCs of material at t_1°C and t_2°C then prove that $\frac{\alpha_1}{\alpha_2} = 1 + \alpha_1 (t_2 - t_1)$. **[06]**

(C) An electric pump lifts 80 m^3 of water per hour to a height of 30 m. The pump efficiency is 85% and the motor efficiency is 75%. If the pump is used for 4 hours daily, calculate the energy consumption per month and energy charges at rate of Rs. 10/kwhr. **[08]**

Q.3) (A) State and explain Superposition Theorem as applied to simple D.C. circuits. **[06]**

(B) Apply Thevenin's Theorem to the circuit shown in **fig. 1** to calculate the current flowing in **Branch A-B :** **[06]**



Q. 4 (B) / Q. 3 (B) Fig. 1

(C) State the formula to convert the star connected network into its equivalent delta connected network. **[04]**

OR

Q.4) (A) State and explain Maximum Power Transfer Theorem. **[06]**

(B) Using Superposition Theorem, calculate current flowing in **Branch A-B** for the circuit. **Shown in fig. 1.** **[10]**

Q.5) (A) Compare Electric Circuit and Magnetic Circuit. **[05]**

(B) Write a short note on Magnetic Leakage and Fringing. **[05]**

(C) Explain, what do you mean by Statically Induced e.m.f. and Dynamically Induced e.m.f. **[06]**

OR

Q.6) (A) Derive expression for the energy stored per unit volume, in the magnetic field. **[06]**

(B) A coil of N turns is wound on a cast iron ring which has mean length of 50 cm and its cross-section is of 4 cm diameter. The current flowing through the coil is 2 Amp which produces a flux of 6 mwb in the air gas of 2 mm length. If the relative permeability of iron is 1000, calculate no. of turns N. **[10]**

SECTION - II

Q.7) (A) Two capacitors C_1 and C_2 are connected once in series and then in parallel. The equivalent capacitance of series combination is 0.4 μF and that parallel combination is 0.2 μF. Calculate the values of C_1 and C_2. **[06]**

(B) Define w.r.t. alternating quantities :

(1) Cycle

(2) Waveform

(3) Amlitude

(4) Periodic Time

(5) Frequency **[05]**

(C) The waveform of a voltage has form factor of 1.15 and peak factor of 1.5. If the maximum value of voltage is 4500V, calculate the average value and r.m.s. value of the voltage. **[05]**

OR

Q.8) (A) Derive an expression for energy stored in a capacitor. **[05]**

(B) Derive an expression for Average Value of the sinusoidally varying current, in terms of peak value. **[05]**

(C) An alternating current varying sinusoidally at 50 Hz has its r.m.s. value of 10 Amp. Write the equation for its instanteous value and find its value at (1) 0.0025 sec after passing thro, +ve maximum value and (2) 0.0075 sec after passing the zero and increasing negatively. **[06]**

Q.9) (A) Prove that current in a purely capacitive circuit leads the applied voltage by 90° and current in purely inductive circuit lags the applied voltage by 90°. **[08]**

(B) A series circuit consist of resistance of 50Ω, inductance of 0.1 H and capacitance of 50 μF connected in series across a single phase 230 V, 50 Hz supply. Calculate current, drawn by circuit, the power factor of the circuit and its nature and total power consumed by the circuit. Draw the phasor diagram. **[10]**

OR

Q.10) (A) Define (1) Admittance, (2) Conductance and (3) Susceptance of an A.C. circuit. Express them in rectangular and polar form and draw the Admittance Triangle. **[08]**

(B) A coil having resistance of 50Ω and inductance of 0.02H is connected in parallel with a capacitance of 25 μF, across single phase 200V, 50 Hz supply. Calculate the current in coil and capacitance. Calculate also the total current drawn, total p.f. and total power consumed by circuit. **[10]**

Q.11) (A) Explain working principle of a tansformer and derive the e.m.f. equation of it. **[08]**

(B) Three Identical Coils each having resistance of 15Ω and inductance of 0.03H are connected in Δ across a 3-phase 400V, 50 Hz supply. Calculate : (1) Phase and Line Current, (2) P.F. and P.F. Angle, (3) Total Power Consumed. **[08]**

OR

Q.12) (A) Write short note : **[08]**

(1) Losses taking place in transformer

(2) An Auto-transformer

(C) Draw a complete phasor diagram for a 3-phase star connected inductive balanced load supplied from 3-phase Symmetrical A.C. Supply.

State the equation for Active Power, Reactive Power and Apparent Power consumed by Load. **[08]**
