

Total No. of Questions : 12]

[Total No. of Printed Pages : 4

[3861]-154

F. E. (Semester - I) Examination - 2010

BASIC ELECTRICAL ENGINEERING

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 100

Instructions :

- (1) *Answers to the two sections should be written in separate answer-books.*
- (2) *Answer Q. No. 1 or Q. No. 2, Q. NO. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10 and Q. No. 11 or Q. No. 12.*
- (3) *Figures to the right indicate full marks.*
- (4) *Neat diagrams must be drawn wherever necessary.*
- (5) *Use of non-programmable pocket size scientific calculator is permitted.*
- (6) *Assume suitable additional data, if necessary.*

SECTION - I

- Q.1)** (A) What is Insulation Resistance ? State its unit and obtain an expression for Insulation Resistance of the Cable. **[08]**
- (B) With neat sketch explain Construction and Working of Lead Acid Cell. **[08]**

OR

- Q.2)** (A) A resistance element having cross-sectional area of 10 mm² and length of 10 meter takes a current of 4 Amp from 200V supply at temperature of 25°C. Find (i) resistivity of the material and (ii) current it will take when temperature rises to 75°C. Assume $\alpha_{25} = .0003/^{\circ}\text{C}$. **[06]**

- (B) If α_1 and α_2 are the two resistance temperature coefficients at $t_1^\circ\text{C}$ and $t_2^\circ\text{C}$, then prove that $(\alpha_1 - \alpha_2) = \alpha_1 \alpha_2 (t_2 - t_1)$. [06]
- (C) State applications of Nickel-Iron Cell and Nickel-Cadmium Cell. [04]

- Q.3)** (A) State and explain Superposition Theorem as applied to Simple DC Circuit. [06]
- (B) State and explain Kirchoff's Laws. [04]
- (C) Determine resistance between (x) and (y) for the circuit shown in fig. 1 : [06]

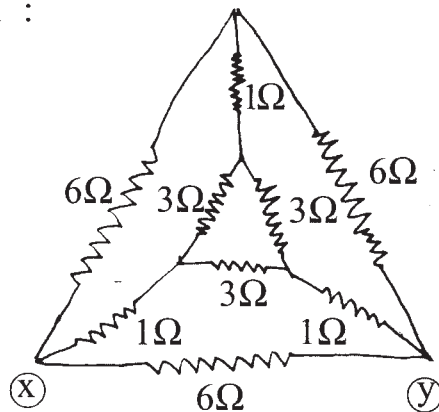


Fig. 1

OR

- Q.4)** (A) State and explain Maximum Power Transfer Theorem. [06]
- (B) Apply Thevenin's Theorem to the circuit shown in fig. 2 to calculate current in 01Ω resistance : [10]

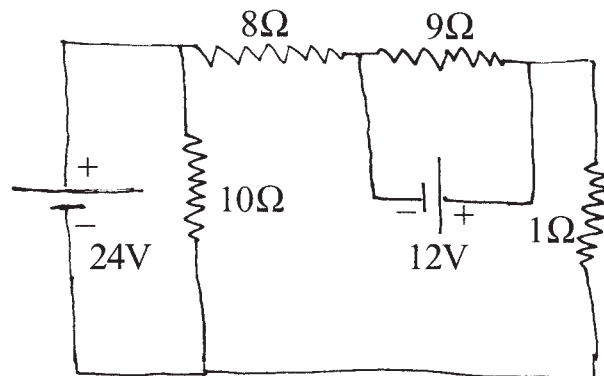


Fig. 2

- Q.5)** (A) Compare Electric and Magnetic Circuit. [08]
- (B) Write short notes : [10]
- (a) Magnetic Leakage and Fringing.
- (b) Energy stored in a Magnetic Field.

OR

- Q.6)** (A) Explain what do you mean by Statically Induced emf and Dynamically Induced emf ? [06]
- (B) A steel ring of 25 cm mean diameter and of circular cross-section 3 cm diameter has an air gap of 1.5 mm length. It is wound uniformly with 700 turns of wire carrying a current of 2 Amp. Calculate :
- (a) MMF
 - (b) Flux Density
 - (c) Reluctance and
 - (d) Relative Permeability of Steel Ring [12]

SECTION - II

- Q.7)** (A) Define w.r.t. alternating quantities : [09]
- (a) Instantaneous Value
 - (b) Waveform
 - (c) Cycle
 - (d) Amplitude
 - (e) Periodic Time
 - (f) Frequency
- (B) Sketch Waveforms of Currents and find its rms value and average value for the equation : [08]
- (a) $i_1 = 15 \sin (314.159 t)$ and
 - (b) $i_2 = 10 \sin (314.159 t - \pi/2)$

OR

- Q.8)** (A) Prove that rms value of the sinusoidal alternating current is 0.707 times its maximum value. [06]
- (B) Derive expression for energy stored in a capacitor. [06]
- (C) Two capacitors of $50\mu\text{F}$ each are connected in parallel with each other and this combination is connected in series with two capacitors of $80\mu\text{F}$ of $40\mu\text{F}$ each. Calculate equivalent capacitance of the circuit. [05]

Q.9) (A) Define and explain following terms : [08]

- (a) Active Power
- (b) Reactive Power
- (c) Impedance
- (d) Admittance

(B) A Circuit consisting of Resistance of 20Ω and Inductance of 0.1 Henry is connected in series across single phase 200V, 50 Hz supply. Calculate :

- (a) Current Drawn
- (b) Power Consumed
- (c) Draw relevant Phasor Diagram

[09]

OR

Q.10) (A) A Coil of Resistance 50Ω and Inductance of 0.1 H is connected in parallel with a branch which consists of resistance of 45Ω in series with a capacitor of $100\mu\text{F}$ across a single phase 230V, 50Hz supply. Calculate Current, Power and p.f. of the Circuit. [09]

(B) If a sinusoidal voltage of $v = V_m \sin \omega t$ is applied across R-C series circuit, derive expression for current drawn and power consumed. Draw their waveforms also. [08]

Q.11) (A) Write short notes : [08]

- (a) Losses taking place in Transformer
- (b) An Autotransformer

(B) Draw a complete phasor diagram for a 3 phase delta connected inductive balanced load supplied for 3-phase symmetrical A.C. supply. State equation for Active Power and Reactive Power consumed by Load. [08]

OR

Q.12) (A) A balanced Star Connected Load is supplied by 3-phase, 415V, 50Hz supply. Current in phase is 20 A and lags 30° behind its phase voltage. Find :

- (a) Power Consumed by Load
- (b) Circuit Parameters, and
- (c) Load p.f.

[08]

(B) Explain working principle of transformer and derive expression for emf induced in its winding. [08]