

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]

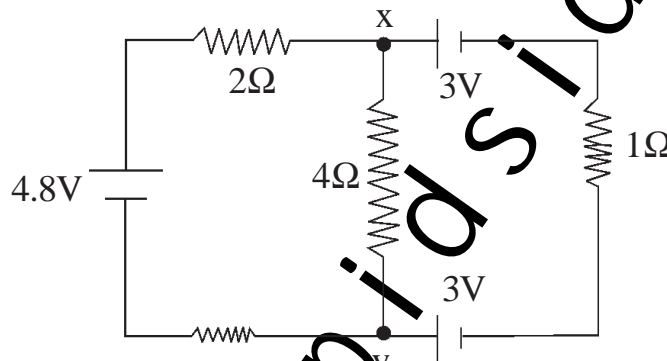


Fig. 1

(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 cm². 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 $3\mu\text{F}$ and $2\mu\text{F}$ 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 $100\mu\text{F}$ capacitor across 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 $500\mu\text{F}$ 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 3000/250 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]