Total No of Questions: [12] **SEAT NO. :**

[Total No. of Pages : 3]

FE 2008 COURSE
BASIC ELECTRICAL ENGINEERING

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary***

SECTION I

Q.1 (a) Define Resistance Temperature Coefficient (RTC). State its unit. With usual notations prove that **8M**

$$\alpha_2 = \alpha_1 / [\, 1 + \alpha_1 (t_2 - t_1) \,]$$

(b) An electric pump lifts 12 m^3 of water per minute to a height of 15 meters. If its overall efficiency is 60 %, find the input power. If the pump is used for 4 hours a day find the cost of energy for the month of April. **8M**

OR

Q.2 (a) Define insulation resistance & Derive its expression for single core cable. **8M**

(b) With neat sketch explain construction & working of Lead Acid Battery. **8M**

Q.3 (a) State & Prove maximum power transfer theorem as applied to a d c resistive circuit. **8M**

(b) Obtain the equations to convert delta connected resistive network into equivalent star connected network. **8M**

OR

Q.4 (a) State & explain Kirchoff's laws as applied to a d c circuit. **8M**

(b) State & explain Superposition Theorem as applied to a d c circuit. **8M**

Q.5 (a) Compare Electric circuit with magnetic circuit stating clearly the similarities & dissimilarities. **8M**

(b) Define self inductance of a coil. & hence state the factors that affect its value. **4M**

(c) The length of an air cored solenoid is 1.7 m & area of cross section is 12 cm^2 . The number of turns of the coil is 1000. Calculate- **6M**

a) the self inductance b) the energy stored in the magnetic field when a current of 10 A flows through the coil.

OR

Q.6 (a) Define & state units of i) Reluctance ii) MMF **8M**

iii) Magnetic flux density iv) permeance

(b) Compare statically induced emf & Dynamically induced emf **4M**

(c) Define coefficient of coupling & Derive expression for it. **6M**

SECTION II

Q.7 (a) Define Average value of sinusoidally varying quantity. Derive its expression in terms of its peak value. **8M**

(b) Two capacitors of 8 µf & 2 µf are connected in series across 400 V supply. Calculate i) resultant capacitance ii) charge on each capacitor iii) voltage across each capacitor. **6M**

(c) Define & state the units of - i) Electric flux density ii) Electric field intensity **4M**

OR

Q.8 (a) Define RMS value of sinusoidally varying quantity. Derive its expression in terms of its peak value. **8M**

(b) An alternating current is given by i= 14.14 sin 377t. Find i) RMS value of current **6M**

Ii) Frequency iii) instantaneous value of current at t= 3 msec. Assume wave starts from origin & increasing positively.

(c) Define – i) Form factor ii) Peak factor **4M**

Q.9 (a) A series R-L-C circuit has resistance of 50 ohms, inductance of 0.1 H & capacitance of 50 µf connected in series across single phase 230 V, 50 Hz supply. Calculate – i) current drawn by circuit ii) power factor of circuit iii) active and reactive power consumed by the circuit. **8M**

(b) Define the terms – i) admittance ii) conductance iii) susceptance as related to a c circuit. State their units. Draw admittance triangle. **8M**

OR

Q.10 (a) Two impedances (8+j6) Ω & (3-j4) Ω are connected in parallel. If the total current drawn by combination is 25 A at unity power factor, find the current and power taken by each impedance. **8M**

(b) Sketch the waveform of voltage, current & power if $v= V_m \sin\omega t$ volts is applied across R-L series circuit. Derive the expression of current in this case. Also **state** the expression of power in this case. **8M**

Q.11 (a) Write short notes on - i) Losses in transformer ii) Dimmerstat **8M**

(b) Three identical coils each having resistance of 10 Ω & inductance of 0.03 H are connected in delta across a three phase 400 V, 50 Hz supply. Calculate – **8M**

i) Phase current ii) line current iii) total power consumed by load.

OR

Q.12	(a)	With the help of neat circuit diagram describe the method of performing direct load test on a single phase transformer. Explain how efficiency & regulation can be calculated in this case.	**8M**
	(b)	Derive the emf equation of single phase transformer.	**4M**
	(c)	**State** the relationship between line value & phase value of voltage and current for 3 phase **star connected load**. Also **state** the expression for active power and reactive power.	**4M**

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