University of Pune
F.E Examination- 2014
BASIC ELECTRICAL ENGINEERING
(2012 Course)

Time: 2 Hours] **[Max. Marks: 50]**

Instructions :

1. **Attempt Q.No. 1 or 2, Q.No. 3 or 4, Q.No. 5 or 6, Q.No. 7 or 8.**
2. **Black figures to the right indicate full marks.**
3. **Neat Diagrams must be drawn wherever necessary.**
4. **Use of Non-Programmable pocket size Scientific Calculators is permitted.**
5. **Assume Suitable Data if necessary**

Q.1 a) With usual notations: derive the relationship, $\alpha_2 = \frac{\alpha_1}{1+\alpha_1(t_2-t_1)}$

And hence obtain (i) $\alpha_t = \frac{\alpha_0}{1+\alpha_0 t}$ (ii) $\alpha_0 = \frac{\alpha_t}{1-\alpha_t t}$ **(6)**

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 A which produces a flux of 6 mWb in the air-gap of 2mm length. If the relative permeability of iron is 1000, calculate the number of turns N. **(6)**

OR

Q.2 a) With reference to a magnetic circuit explain the terms - i) magnetic flux, ii) magneto-motive force, iii) magnetic field intensity, iv) magnetic flux density, v) reluctance, vi) permeability of free space. State their units. **(6)**

b) A pump driven by a DC electric motor lifts 1.5 m^3 of water per minute to a height of 40 m. The pump has an efficiency of 90 % and the motor an efficiency of 85%. Determine (i) the power input to the motor, (ii) the current taken from a 480 V supply. Assume the mass of one m^3 of water is 1000 kg. **(6)**

Q.3 a) Draw neat sketches to show core-type and shell –type single phase transformers. State:
i) losses occurring in the transformer on load.
ii) their location, cause, whether constant or variable.
iii) factors on which they depends **(6)**

b) A series of combination having R= 2 MΩ and C= 0.01μF is connected across the DC source of 50 V. Determine the capacitor voltage and charging current after 0.02s and 0.06s . **(6)**

OR

Q.4 a) Derive an expression for instantaneous current and power consumed when voltage of $V = V_m \sin(wt)$ is applied to pure inductance alone. Also draw the phasor diagram. **(6)**

b) A transformer is rated at 100 KVA. At full load, its copper loss is 1200 W and its iron loss is 960 W. Calculate: (i) Efficiency at full load, 0.8 power factor,
(ii) Load KVA at which maximum efficiency will occur.
(iii) Maximum efficiency at 0.85 power factor **(6)**

Q.5 a) Three identical coils, each having resistance of 15 Ω and inductance of 0.03 H, are connected in delta across a 3 phase ,400 V,50 Hz supply. Calculate : (i) the phase current, (ii) the line current, (iii) the power consumed. **(7)**

b) Derive the expression for line voltage in terms of phase voltage for three phase star connected balanced load, with phasor diagram across three phase supply. **(6)**

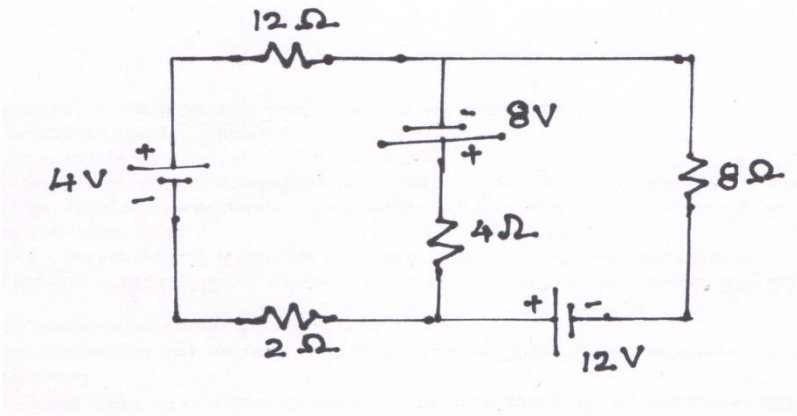
OR

Q.6 a) An emf given by v=100 sin 100πt is impressed across a circuit consisting of resistance of 40 Ω in series with 100 μF capacitor and 0.25 H inductor. Determine: (i) rms value of the current, (ii) power consumed, (iii) power factor . **(7)**

b) For a single –phase a.c circuit, the applied voltage is $v=V_m \sin \omega t$ and current drawn is $i=I_m \sin (\omega t-\phi)$ .Derive expression for average power. Draw waveform of voltage, current and instantaneous power over one cycle of voltage. **(6)**

Q. 7 a) State and explain Thevenin's Theorem. **(6)**

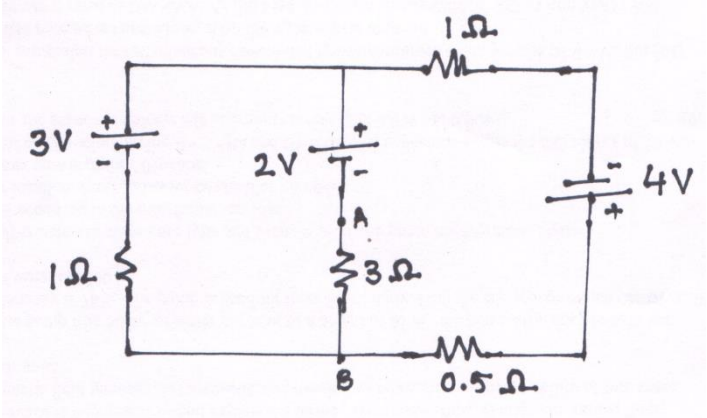
b) Apply Kirchhoff's Law to calculate current drawn by 4Ω resistance for the circuit. **(7)**



OR

Q.8 a) Derive formula to convert DELTA connected network into its STAR connected equivalent circuit**.** **(6)**

b) Apply superposition theorem to calculate current flowing in 3 Ω resistance for the network**.** **(7)**



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