

Total No. of Questions : 12

[Total No. of Printed Pages :4]

F.E. Examination – 2013
Basic Electrical Engineering
[4361]-4
(2008 Pattern)

[Time : 3 Hours]

[Max. Marks : 100]

Instructions :

- (1) Answer 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) Answers to the two sections should be written in *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 whenever necessary.
- (6) Assume suitable data, if necessary.

Section I

Q. 1. (a) Derive an expression for insulation resistance of a single core cable? (08)

(b) A bucket contains 20 liters of water at 20°C. A 2.5 KW immersion heater is used to raise temperature of water to 95°C. If the overall efficiency of process is 90%, calculate the time required for the process. Find the cost of energy for 365 days if energy rate is Rs. 07 per unit. Assume Sp heat Cap. of water =4200 J/kg-k. (08)

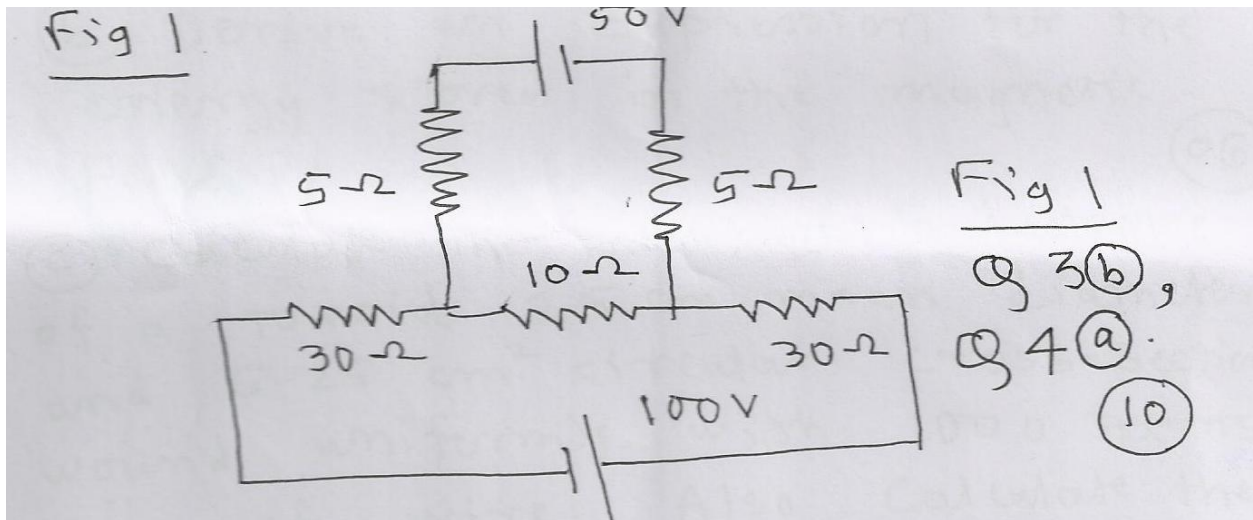
OR

Q. 2. (a) Compare Lead Acid cell and Nickel Cadmium cell. (06)

(b) A single core copper cable has a conductor diameter of 4cm and thickness of 3cm. The resistivity of copper and its insulation material is $1.73 \times 10^{-8} \Omega\text{m}$ and $9 \times 10^{12} \Omega\text{-m}$ respectively. Determine the resistance of conductor & insulator of the cable for the 150 meter length. (10)

Q.3. (a) State and explain. (06)
Kirchhoff's laws as applied to simple D.C. circuit.

(b) Determine the current delivered by 50V source of 100V source for (10)
circuit shown in Fig. 1



Q.4. (a) Apply Superposition theorem, to calculate current flowing in 10Ω resistance for the circuit shown in Fig. 1. (10)

(b) Derive formulae to convert Delta connected network into its star connected equivalent network. (6)

Q.5. (a) Compare Electric & Magnetic circuits. (8)

(b) A coil of 200 turns is wound uniformly over a magnetic ring of 80cm (10)
mean circumference and cross sectional area of 0.6 cm^2 . If the current through the coil is 2Amp, calculate i) magnetizing Force ii) reluctance iii) Flux and iv) Flux density.

Q.6. (a) State and explain faraday's laws of Electromagnetic induction. (06)

(b) Derive an expression for the energy stored in the magnetic Field. (06)

(c) Calculate the inductance of a toroid 25cm mean diameter and 6.25 (06)
circular cross-section wound uniformly with 1000 turns wire. Also calculate the
emf induced when a current increasing at the rate of 200A/s flows in the winding.

Section- II

Q7. (a) Define average value of alternating quantity. Derive the expression for
average value of a sinusoidally varying current. (08)

(b) A sinusoidal voltage of 50Hz has a maximum value of 282.84V. At what
time from the positive zero crossing will the instantaneous voltage be equal to
+141.4 and -141.4V (08)

OR

Q8. (a) Define the terms.

(i) Electric Flux (ii) Electric Flux density (iii) Electric Field strength and
(iv) permittivity. (08)

(b) Define rms value of an alternating quantity. Drive an expression for rms
value of a sinusoidally varying current. (08)

Q9. (a) Prove that current in purely capacitive leads the applied voltage (10)
by 90° and current in purely inductive circuit lags the applied voltage by 90°

(b) A series R-C circuit consisting of resistance of 50 ohms and capacitor of
100 μ f is connected across 230V, 50 Hz supply. Calculate voltage across Resistance
& capacitance, power factor & power consumed. (08)

OR

Q10. (a) Define i) admittance, ii) conductance and iii) susceptance and draw the
admittance triangle. (08)

(b) The two impedance $(8+j6)$ ohm and $(3-4j)$ ohm are connected in parallel. If the total current draw is 25 Amps, calculate the current & power taken by impedance. (10)

Q11. (a) Write short note on (10)

- i) Losses taking place in transformer and
- ii) An auto transformer.

(b) Define i) Phase Sequence, ii) symmetrical supply and iii) Balanced load. (06)

OR

Q12. (a) Derive expression for emf induced in a transformer. (06)

(b) Three coils, each having a resistance of 8Ω and an inductance of $0.02H$, are connected in delta across a three Phase, 400V, 50Hz supply. Calculate power consumed by load. If same coil are connected in star across same supply, Calculate power consumed. (10)