17214

16172

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Answer ***each*** *next main question on a* ***new*** *page.*
(3) Illustrate your answers with neat sketches ***wherever*** *necessary.*
(4) Figures to the ***right*** *indicate* ***full*** *marks.*

Marks

I. Attempt **any ten** of the following : **(10×2=20)**

1) Define resistance. Also mention the factors upon which it depends.
2) What is internal voltage drop and terminal voltage ?
3) State any two features of carbon composition resistors.
4) State Ohm's law. Also express it in the form of equation.
5) What is dielectric strength of an insulating material ? What is its unit ?
6) State any two applications of electromagnet.
7) Define magnetic line of force. Also draw and show magnetic lines of force of a bar type magnet.
8) State Lenz's law.
9) Classify electrical materials.
10) State Faraday's laws of electromagnetic induction.
11) What is Amorphons metal ? Give one application of this metal.
12) State the factors affecting hysteresis loss.

II. Attempt **any four** of the following : **(4×4=16)**

1) Why is source conversion needed ? Also explain how voltage source can be converted into an equivalent current source. Explain with suitable figures.
2) A potential difference of 200 V is applied to copper field coil at a temperature of 15° C and the current is 10A. What will be the mean temperature of the coil when the current has fallen to 5A, the applied voltage being the same as before ? $\alpha_{15} = \frac{1}{534.5}$ /°C.

P.T.O.

Marks

3) Prove that $I_1 = \frac{IR_2}{R_1 + R_2}$ in the parallel combination of two resistances R_1 and R_2.

4) State and explain Kirchoff's current law and voltage law.

5) Two batteries A and B are connected in parallel and a load of 10 Ω is connected across their terminals. A has an e.m.f. of 12 V and an internal resistance of 2 Ω ; B has an e.m.f. of 8 V and an internal resistance of 1 Ω. Use Kirchoff's laws to determine the values and direction of the currents flowing in each of the batteries and in the external resistance. Refer Fig. 1.

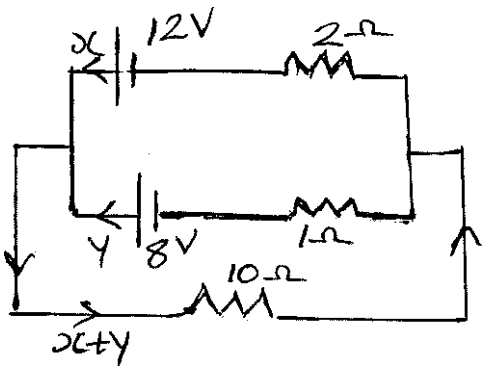

Fig. 1

6) Define the following terms of a magnetic circuit :
   a) MME
   b) Ampere turns
   c) Reluctance
   d) Permeance.

III. Attempt **any four** of the following : **(4×4=16)**

1) Derive the equation to find capacitance of a capacitor having medium partly air.

2) Draw the arrangement by which a capacitor C may be charged through a resistance R and explain it in brief.

3) Three capacitors A, B, C have capacitances 10, 50 and 25 μF respectively. Calculate (a) charge on each when connected in parallel to a 250 V supply (b) total capacitance.

4) A 50 μF capacitor is charged from a 200 V supply. After being disconnected, it is immediately connected in parallel with a 30 μF capacitor. Find (a) p.d. across the combination (b) the electrostatic energies before and after the capacitors are connected in parallel.

Marks

5) What is magnetic hysteresis ? What is the cause of hysteresis ?

6) Define the following terms as referred to battery :
   a) E.M.F.
   b) Internal resistance
   c) Ah efficiency and
   d) WAh efficiency.

IV. Attempt **any four** of the following : **(4×4=16)**

1) State any two harmful effects of hysteresis loss. Also draw hysteresis loop for (a) non-magnetic material (b) hard steel.

2) With the help of diagram, explain the concept of leakage flux, useful flux and fringing.

3) A mild steel ring having a cross-sectional area of 5 cm^2 and a mean circumference of 40 cm has a coil of 200 turns wound informly around it. Calculate :
   a) Reluctance of the ring
   b) Current required to produce a flux of 800 μ Wb in the ring.

   Assume relative permeability of mild steel as 380.

4) In the network of resistances shown in Fig. 2. Calculate the network resistance measured between B and C.

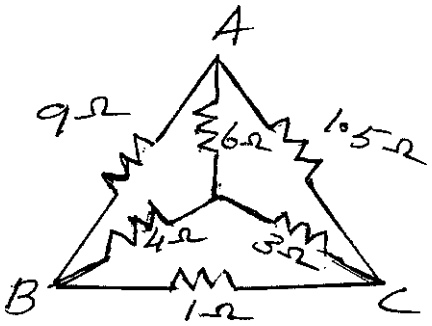

Fig. 2

5) Write down any three similarities between electric and magnetic circuits. Also give one important dissimilarity.

6) Classify insulating materials on the basis of state of material. Give two examples of each.

V. Attempt **any four** of the following : **(4×4=16)**

1) Define self inductance and mutual inductance. Also write one equation for each.

2) Compare statically induced e.m.f. with dynamically induced e.m.f. on any four points.

3) Derive an expression for energy stored in a magnetic field.

Marks

4) Calculate the inductance of a solenoid of 2000 turns wound uniformly over a length of 50 cm on a cylindrical paper tube 4 cm in diameter. The medium is air.

5) State any four advantages of A.C. over D.C.

6) Compare series resistive circuit with parallel circuit on any four points.

VI. Attempt **any four** of the following : **(4×4=16)**

1) Describe current charging method of batteries in brief.

2) Compare dry cell with liquid cell on any four points.

3) Define the following terms in connection with A.C. generator :
   a) Cycle
   b) Frequency
   c) Time
   d) Amplitude

4) Write down any two electrical and any two mechanical properties of high conductivity materials.

5) Classify magnetic material. Explain each type in brief.

6) Find the resistance between the points P and Q in the series parallel network shown in Fig. 3.

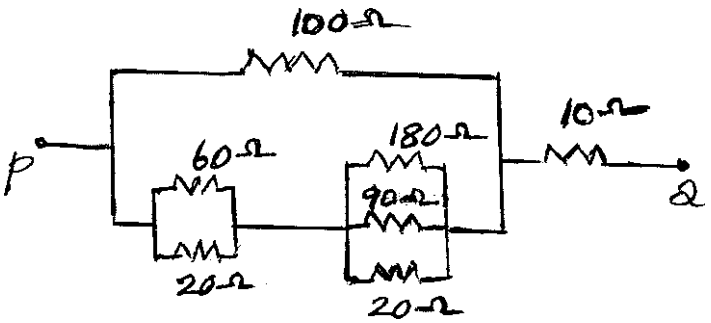

Fig. 3