22212

12425

3 Hours / 70 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.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE : **10**

(a) Define "Electric Current" and express it mathematically.

(b) State "Ohm's law" and express it mathematically.

(c) Define "Breakdown voltage" and state its unit.

(d) Define "MMF" and state its unit.

(e) Define "Reluctance" and state its unit.

(f) State "Fleming's Right Hand rule".

(g) State "Lenz's rule".

2. Attempt any THREE : **12**

(a) With neat diagram, explain magnetic effect of electric current flowing through –
(i) Straight conductor (ii) Coil.

(b) With a neat circuit diagram, explain the terms :
(i) Node (ii) Branch (iii) Loop (iv) Mesh.

(c) Derive an equation for energy stored in a capacitor.

(d) With the help of neat circuit diagram, explain the concept of :

(i) Self-induced emf. (ii) Mutually induced emf.

3. Attempt any THREE : **12**

(a) With neat diagram and suitable example, explain chemical effect of electric current.

(b) Calculate the resistance of a 100 m length of wire having a uniform cross-sectional area of 0.02 mm^2 and having resistivity of 40 $\mu\Omega$ cm. If the wire is drawn out to four times its original length, calculate its new resistance.

(c) Distinguish between :

(i) Active circuit and Passive circuit.

(ii) Unilateral circuit and Bilateral circuit.

(d) Derive an equation for capacitance of parallel plate capacitor.

4. Attempt any THREE : **12**

(a) A bulb rated 230 V, 60 W is connected in series with another bulb rated 230 V, 100 W. If this combination is connected across 230 V supply, calculate energy consumed by each bulb in 2 hrs.

(b) Calculate the terminal voltage of a battery source having emf of 12 V, internal resistance of 1 Ω and load resistance of 9 Ω. Also calculate the load current.

(c) Applying Kirchhoff's laws, find the potential difference between points X and Y in the network shown in Fig.1 :

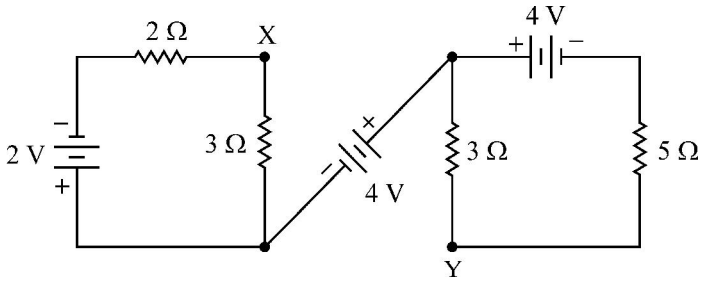

Fig. 1

(d) A 100 μF capacitor is being charged through 10 kΩ resistor from 100 V dc supply.

Determine :

(i) Charging time constant

(ii) Initial value of charging current

(iii) Voltage and current of capacitor after 5 millisecond from the start of charging.

(e) Two capacitors 100 μF and 50 μF are connected in parallel. This parallel combination is then connected in series with a 200 μF capacitor. Finally this series – parallel combination is connected across 100 V dc supply.

Calculate :

(i) Voltage across each capacitor

(ii) Charge on each capacitor

(iii) Energy stored in each capacitor.

5. Attempt any TWO : **12**

(a) State any four similarities and any two differences between electric circuit and magnetic circuit.

(b) An iron ring has a circular cross-section of 300 mm^2 and a mean diameter of the ring is 200 mm. It is uniformly wound with 800 turns of copper wire. Relative permeability is 500.

Calculate :

(i) Magnetic field strength produced in the core by a current of 3 A.

(ii) Magnetic flux density produced by this current.

(iii) The current required to produce a flux density of 0.8 Wb/m^2.

(c) Two coils, A of 12000 turns and B of 15000 turns, lie in parallel planes such that 60% of the flux produced by coil A links with coil B. A current of 5 A in coil A produces a flux of 0.05 mWb, while the same current in coil B produces a flux of 0.075 mWb.

Find :

(i) Self-inductance of each coil

(ii) Mutual inductance

(iii) Coefficient of coupling.

6. Attempt any TWO : **12**

(a) Determine the mmf, flux, reluctance and flux density in the steel ring of 30 cm mean diameter and a circular cross-section of 2 cm diameter. It has an air-gap of 1 mm length. It is wound with a coil of 600 turns carrying a current of 2.5 A. Neglect magnetic leakage. The iron path takes 40% of total mmf.

(b) Two coils, A and B, have self-inductances of 120 μH and 300 μH, respectively. A current of 1 A through coil A produces flux-linkages of 100 μWb-turns in coil B.

Calculate :

(i) Mutual inductance between the coils.

(ii) The coupling coefficient

(iii) The average emf induced in coil B if a current of 1 A in coil A is reversed at a uniform rate in 0.1 sec.

(c) A flux of 0.5 mWb is produced in a coil of 900 turns wound on a ring by a current of 5 A. Another coil of 600 turns is wound uniformly over the first coil such that 80% of the flux produced by any one coil links with the other coil.

Calculate :

(i) Self-inductance of each coil.

(ii) Mutual inductance.

(iii) Coefficient of coupling.

(iv) Energy stored in first coil when it carries a current of 5 A.
