

- (b) For the circuit shown in Figure 2, find I such that current in the $100\ \Omega$ resistor is zero. 15

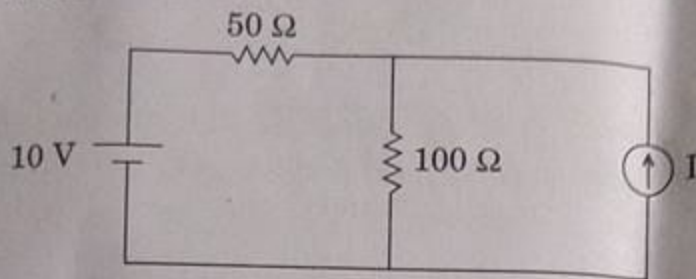


Figure 2

- (c) A series combination of two capacitances $C_1 = 5\ \mu\text{F}$ and $C_2 = 10\ \mu\text{F}$ is connected across a dc supply of 300 V. Determine the
- charge
 - voltage
 - energy stored in each capacitor 15
- (d) Define the following terms : 15
- Self-inductance
 - Flux
 - RMS value of alternating waves
3. (a) A circular coil of area $300\ \text{cm}^2$ and 25 turns rotates about its vertical diameter with an angular speed of $40\ \text{rad/sec}$ in a uniform horizontal magnetic field of magnitude $0.05\ \text{T}$. Find the maximum voltage induced in the coil. 10
- (b) Define the following terms : 15
- Reluctance
 - Permeance
 - Magnetic Field Strength

- (c) A coil has 1000 turns enclosing a magnetic circuit of 20 cm^2 in cross-section, with 4 A current in the coil, the flux density is 1.5 Wb/m^2 , and with 8 A current, it is 1.9 Wb/m^2 . Find the mean value of inductance between these current limits and the induced emf if the current decreases from 8 A to 4 A in 0.05 sec. 15
- (d) A coil A of 1500 turns and another coil B of 800 turns lie near each other so that 60 percent of the flux produced in one links with the other. It is found that a current of 5 A in coil A produces a flux of 0.25 mWb, while the same current in coil B produces a flux of 0.15 mWb. Determine the mutual inductance and coefficient of coupling between the coils. 20
4. (a) Determine the average and rms value of the resultant current in a wire carrying simultaneously a dc current of 40 A and sinusoidal current of peak value of 1.414 A. 10
- (b) The resistance of a coil is 3Ω and its time constant is 1.8 sec. At $t = 0$ sec, a 10 V source is connected to it. Determine the
- current at $t = 1$ sec
 - time at which the current attains half of its final value
 - initial rate of growth of current
- (c) Explain in brief the following : 20
- Energy meter
 - CRO
 - 2 wattmeter method
 - Multimeter
- (d) In a moving coil instrument, the coil has a length of 5 cm, a width of 4 cm and 100 turns. The magnetic flux density in the air gap is 0.2 Wb/m^2 . The hair spring provides a controlling torque of $0.5 \times 10^{-7} \text{ Nm/degree}$ deflection of the coil. What current will be required to give a deflection of 60° ? 15

5. (a) A shunt generator gives full load output of 30 kW at a terminal voltage of 200 V. The armature and shunt field resistances are 0.01 Ω and 100 Ω respectively. The iron and friction losses are 1000 W. Calculate the 15
- (i) emf generated
- (ii) copper losses
- (iii) efficiency
- $$E_g = V + I_a R_a$$

$$= 200 + 17$$
- (b) Explain dynamic braking of 3-phase induction motor. 15
- (c) Explain in brief the following : 15
- (i) Fractional kilowatt motors
- (ii) Auto transformers
- (iii) S.C. test of 3-phase transformer
- (d) Explain parallel operation of two alternators. 15
6. (a) Explain in brief of the following : 30
- (i) Merz-price system of protection
- (ii) Short-circuit current for symmetrical faults
- (iii) Electric welding
- (b) How is the rating of a cable determined ? 10
- (c) What are the different configurations of BJT ? Explain each with suitable circuit diagram. 10
- (d) Explain electric installation of machines and relevant IE rules in brief. 10