(Set-$R_1$)

# B.Tech - 2nd
# Basic Electrical Engineering

*Full Marks* : 70

*Time* : 3 hours

**Answer Q. No. 1, which is compulsory and five from the rest seven questions**

***The figures in the right-hand margin indicate marks***

**1. Answer the following questions :** **2 × 10**

**(*a*) Find the equivalent resistance between *X* and *Y* in the figure 1. All resistances values are in Ω.**

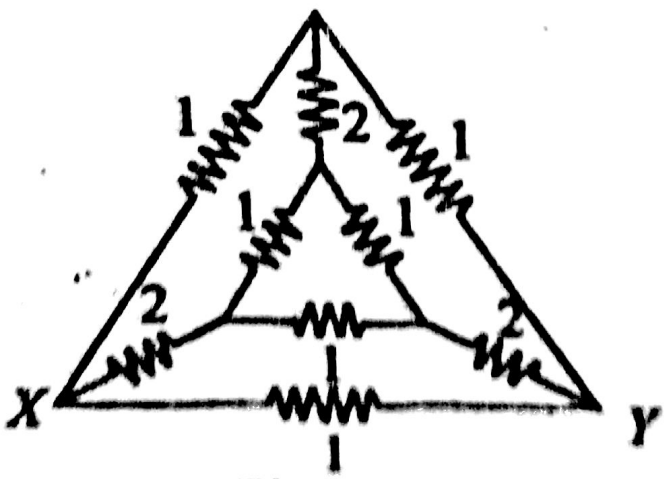



**Figure 1**

(b) In the circuit shown in figure 2, switch 'S' is closed at $t = 0$. After sometime, when the current in the inductor was 6A, the rate of change of current through it was 4A/sec. What is the value of the inductance 'L'?

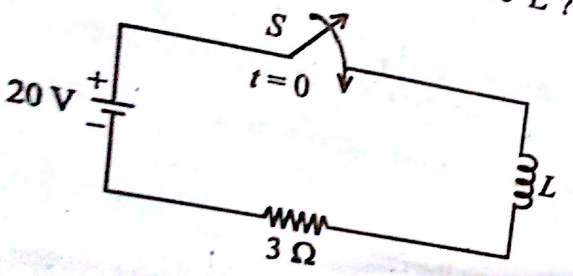



Figure 2

(c) A current $i = 5 \sin(314\,t - 10°)$ produces a voltage drop of $v = 200 \sin(314t + 20°)$ in the circuit components connected in series. Find the value of the circuit components.

(d) What is the reluctance of a magnetic core that is 1·25 cm wide, 2·0 cm deep and 15 cm



long and has a permeability of $12{\cdot}5 \times 10^{-4}$ Wb/A-T-m?

(e) What are the requirements for self excitation of dc shunt generator?

(f) What is the condition for dc motor for delivering maximum power?

(g) Give the merits of an autotransformer over two winding transformer of same rating.

(h) The supply frequency of a 6 pole induction motor is 50 Hz. The frequency of its rotor current is 2 Hz. What is the speed of the motor and its slip?

(i) Explain why a synchronous motor is not self starting.

(j) Why should the potential coil of a dynamometer type wattmeter be highly non -inductive?

2. (a) Find the current through the 5Ω resistor in the figure 3 using superposition theorem. 5

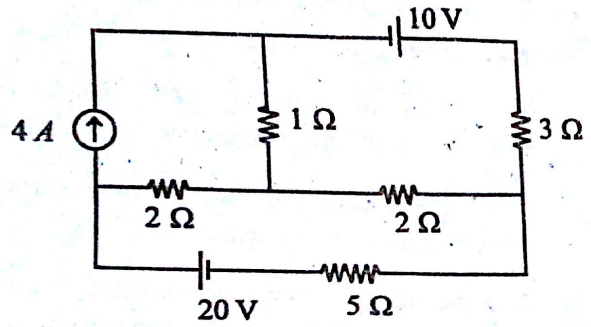
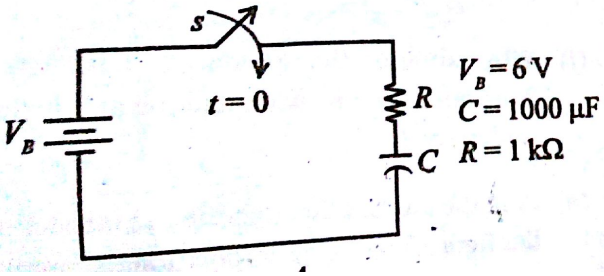



Figure 3

**(b) In the circuit given in figure 4, the switch 'S' is closed at time $t = 0$. Determine the time required for the energy stored in the capacitor to reach 90% of the maximum Value. Assume initial capacitor charge to be zero.** 5






3. (a) A 100 Ω resistor, 20 μF capacitor and a 2 H inductor are connected in series. At what frequency is the phase angle 45°. 5

(b) A balanced delta connected load of $(8 + j6)\Omega$ per phase is connected to a 3-phase 230 V supply. Find the line current, power factor, power, reactive power and total volt-amperes. 5

4. (a) An iron ring with a mean circumference of 140 cm and cross-section 12 $cm^2$ is wound with 500 turns of wire. When the exciting current is 2A, the flux is found to be 1·2 mWb. Determine relative permeability of iron. 5

(b) What is meant by hysteresis loop ? What is its significance ? How do you reduce the hysteresis loss ? 5

5. (a) A dc shunt generator supplies a load at the voltage of 230 V. The armature resistance of the generator is 0·03 Ω and the field resistance is 120 Ω. Determine the value of

load current and load power when it generates an emf of 240 V. The effect of armature reaction may be neglected. 5

(*b*) A 250 V dc shunt motor on no load runs at 1000 rpm and takes 5A. The total armature and shunt field resistances are respectively 0·2 Ω and 250 Ω. Determine the speed when loaded taking a current of 50 A, if armature reaction weakens the field by 3%. 5

6. (*a*) Explain the operation of a synchronous motor when a change in load on the motor takes place. 5

(*b*) Explain with the help of schematic diagram the principle of operation of 1-phase split phase induction motor. 5

7. (*a*) Explain with neat diagram the working principle of a moving iron ammeter. Give its applications. 5

(*b*) Explain the construction and principle of operation of an induction type energy meter. 5



8. (*a*) With a schematic diagram, explain principle of the generation of electric power in a hydel power plant. 5

(*b*) Explain various schemes of distribution of electrical energy. 5

---

$R = \frac{l}{\mu A}$

$l = 0.15\ cm$

$\mu = 12.5 \times 10^{-4}$

$A = 1.875 \times 10^{-2}$