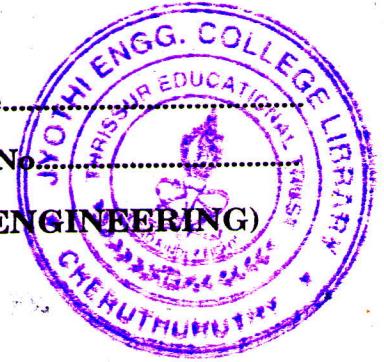# COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2005

AI2K 109. BASIC ELECTRICAL ENGINEERING

(Common to EE, EC, IC, BM and BT)

Time : Three Hours   Maximum : 100 Marks

1. (a) State and explain Kirchhoff's voltage law with an example.

    (b) Differentiate between electric and magnetic circuits.

    (c) State and prove superposition theorem.

    (d) A series R-L circuit with R = 30 Ω and L = 15 H has a constant voltage of V = 60 V applied at $t = 0$ as shown in Fig. 1. Determine the current, the voltage across resistor and inductor.
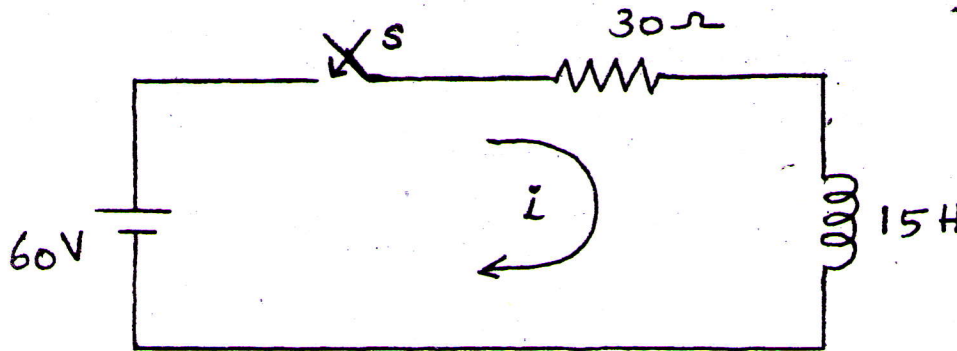

Fig. 1

    (e) Discuss how half power frequencies can be related to bandwidth.

    (f) Define active power and reactive power with expressions.

    (g) Differentiate between single-phase and three-phase system.

    (h) Each phase of 3-φ alternator produces a voltage of 6351 volts and carry a max. current of 315 A. Find the line voltage, maximum line current and total kVA capacity of the alternator if it is (i) star connected and (ii) delta connected.

                                   (8 × 5 = 40 marks)

Unit I

2. (a) (i) When a d.c. voltage is applied to a capacitor, the voltage across its terminals is found to build up in accordance with $v_c = 50\left(1 - e^{-100t}\right)$. After the lapse of 0.01 s, the current flow is equal to 2 mA. What is the value of capacitance in microfarads and how much energy is stored in the electric field at this time ?

                                   (6 marks)

Turn over

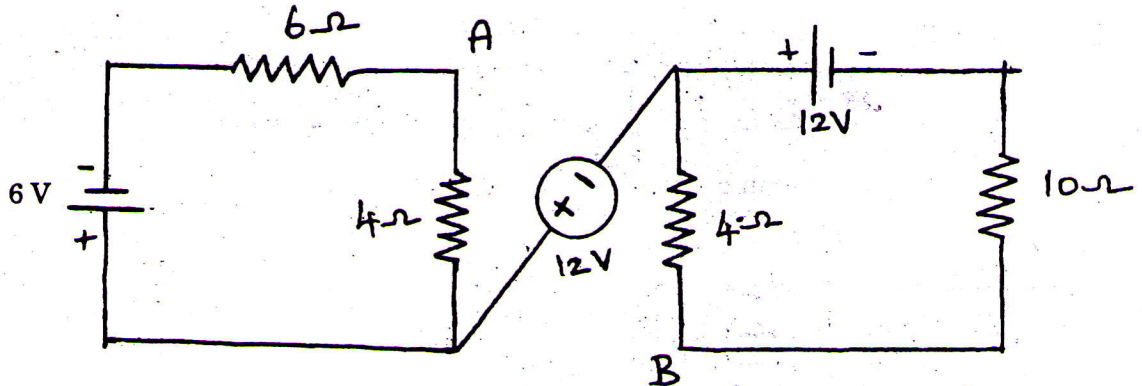(ii) What is the voltage across A and B in the circuit shown in Fig. 2 ?

Fig. 2

(9 marks)

Or

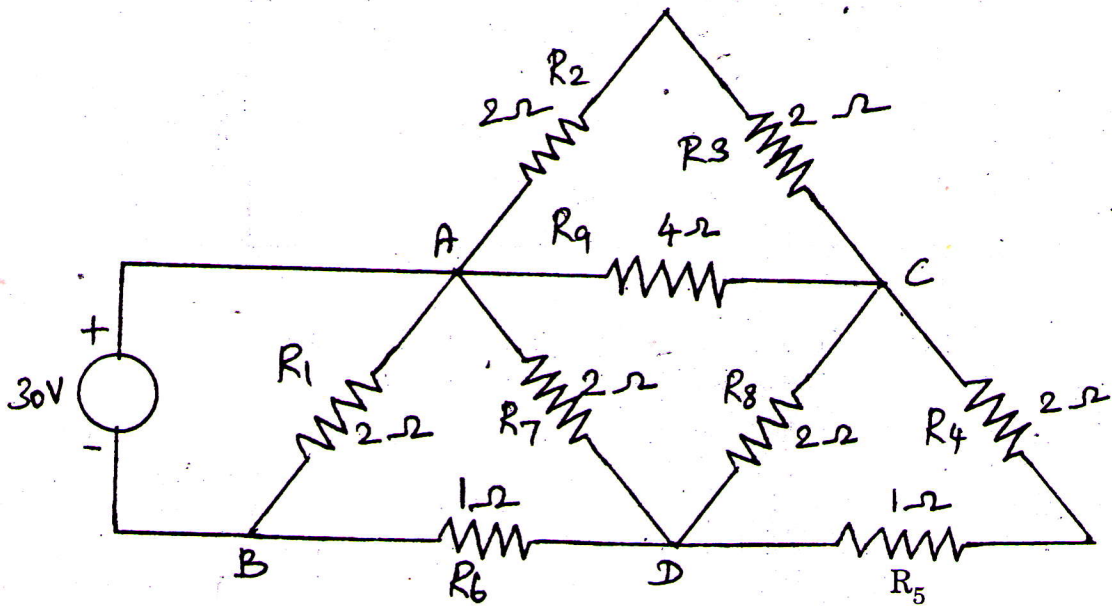(b) Determine the current delivered by the source in the circuit shown in Fig. 3.

Fig. 3

(15 marks)

Unit II

3. (a) (i) A 5 Ω resistance and 20 H inductance are connected in series across a battery. At the instant of closing the switch, the current increases at the rate of 4A/s. Find the supply voltage, rate of growth of current when 5A flows in the circuit and the energy stored under both conditions.

(6 marks)