Home Work 6

6-1 In Fig. 27-52, two batteries of emf ☜ = 12.0 V and internal resistance r = 0.300 Ω are connected in parallel across a resistance R. (a) For what value of R is the dissipation rate in the resistor a maximum? (b) What is that maximum? (HRW27-41)

6-2 Two identical batteries of emf ☜ = 12.0 V and internal resistance r = 0.200 Ω are to be connected to an external resistance R, either in parallel (Fig. 27-52) or in series (Fig. 27-53). If R = 2.00r, what is the current i in the external resistance in the (a) parallel and (b) series arrangements? (c) For which arrangement is i greater? If R = r/2.00, what is ♓ in the external resistance in the (d) parallel and (e) series arrangements? (f) For which arrangement is ♓ greater now? (HRW27-42)

6-2 In Fig. 27-61, Rs is to be adjusted in value by moving the sliding contact across it until points a and b are brought to the same potential. (One tests for this condition by momentarily connecting a sensitive ammeter between a and b; if these points are at the same potential, the ammeter will not deflect.) Show that when this adjustment is made, the following relation holds: Rx = RsR2/R1. An unknown resistance (Rx) can be measured in terms of a standard (Rs) using this device, which is called a Wheatstone bridge. (HRW27-55)

6-3 (a) If points a and b in Fig. 27-61 are connected by a wire of resistance r, show that the current in the wire is

$$i = \frac{\mathscr{E}(R_s - R_x)}{(R + 2r)(R_s + R_x) + 2R_sR_x}$$

Where ☜ is the emf of the ideal battery and R = R1 = R2. Assume that R0 equals zero. (b) Is this formula consistent with the result of Problem 55? (HRW27-111)

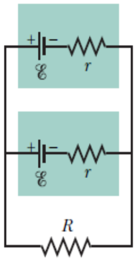


FIG. 27-52

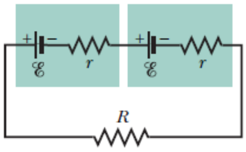


FIG. 27-53 Problem 42.

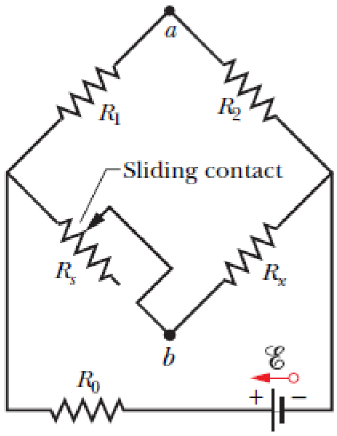
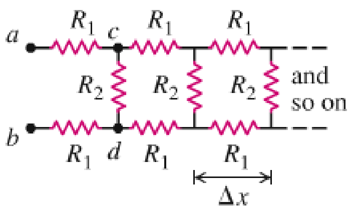


FIG. 27-61
Problems 55 and 111.

26.91 ••• **An Infinite Network.** As shown in Fig. P26.91, a network of resistors of resistances R_1 and R_2 extends to infinity toward the right. Prove that the total resistance R_T of the infinite network is equal to

$$R_T = R_1 + \sqrt{R_1^2 + 2R_1R_2}$$

Figure **P26.91**



(*Hint:* Since the network is infinite, the resistance of the network to the right of points c and d is also equal to R_T.)

26.92 ••• Suppose a resistor R lies along each edge of a cube (12 resistors in all) with connections at the corners. Find the equivalent resistance between two diagonally opposite corners of the cube (points a and b in Fig. P26.92).

Figure **P26.92**