Faculty of Engineering–Shoubra
Electrical Engineering Department
2nd year communication
Sheet (3)

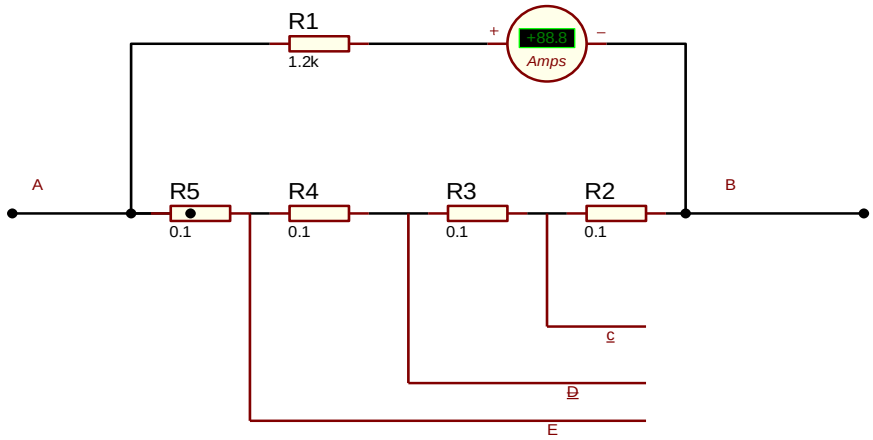
(1) A PMMC inst. With a 750 Ω coil resistance gives FSD with a 500μA coil current. Determine the required shunt resistance to convert the instrument into a DC ammeter with FSD:

(a) 50 mA (b) 30 mA

(2)A DC ammeter is constructed of 133.3 Ω resistance in parallel with a PMMC inst. If the inst. has 1.2 KΩ coil resistance and 30μA FSD, Determine the measured current at:

(a) FSD (b) 0.5 FSD (c) 0.33 FSD

(3)A DC ammeter consists of an Ayrton shunt in parallel with a PMMC inst. that has a 1.2 kΩ coil resistance and 100μA FSD. The Ayrton shunt is made up of four 0.1Ω series connected resistors. Calculate the ammeter range at each setting of the shunt.



(4) A 12 V source supplies 25 A to a load. Calculate the load current that would be measured, and the ammeter loading effect when using an ammeter with resistance of:

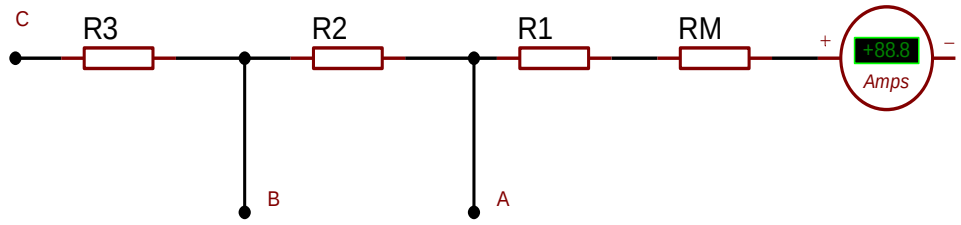
(a) 0.52 Ω (b) 0.12 Ω (c) 0.002 Ω

(5)A PMMC inst. with a 900 Ω coil resistance and an FSD 75 μA coil is to be used as a DC voltmeter. Calculate the individual multiplier resistance to give a FSD of

(a) 5V (b) 30V (c) 100V.

Also determined the voltmeter sensitivity in each case?

(6) A PMMC inst. With a 900 Ω coil resistance and an FSD 75 μA coil is to be used as a DC voltmeter. Calculate the multiplier resistance values when series connected multipliers are used to have the ranges:
(a) 5V (b) 30V (c) 100V.
Also determined its sensitivity in each case?



(7)A PMMC inst. with R_m =1.3 kΩ and FSD=500 μA is used in a multi range DC voltmeter. The series connected multiplier resistors are R_1= 38.7kΩ, R_2=40kΩ, and R_3=40kΩ. Calculate the three voltage ranges and determine the voltmeter sensitivity for each range setting.

(8) Two resistors R_1= 47kΩ, R_2=82kΩ, are connected in series across a 15V supply. A voltmeter on 10 V range is connected to measure across R_2. The voltmeter sensitivity is 10 kΩ/V. Calculate V_{R2}, and the voltmeter loading effect when the voltmeter is:
(a) Disconnected
(b) Connected

(9)A 100kΩ potentiometer and 33 kΩ resistor are connected in series across a 9 V supply. Calculate the max. voltage that can be measured across the potentiometer, and the voltmeter loading effect using a voltmeter with:
(a) 20 kΩ/V sensitivity and a 15V range.
(b) 100 kΩ/V sensitivity and a 10V range.

(10) Two resistors R_1= 70 kΩ, R_2=50 kΩ, are connected in series across a 12V supply. A voltmeter on 5 V range is connected to measure the voltage across R_2 Calculate V_{R2}, and the voltmeter loading effect when the voltmeter:
(a) Disconnected
(b) Has a sensitivity of 20 kΩ/V
(c) Has a sensitivity of 200 kΩ/V

(11) An AC voltmeter uses a bridge rectifier with silicon diodes and a PMMC instrument with FSD = 75 μA. If the meter coil resistance is 900 Ω and the multiplier resistor is 708 kΩ, calculate the applied rms voltage when the voltmeter indicates FSD and find the voltmeter sensitivity.

(12) Determine the new multiplier resistance required for the voltmeter in problem (11) to extend its range to 300V FSD. Then determine the pointer position of the voltmeter when the applied RMS voltage is:

(a)150 V,

(b) 75 V

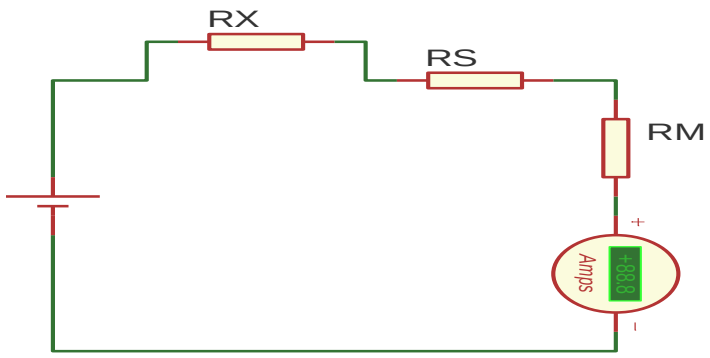
(13) A rectifier AC ammeter is to indicate full scale for a 1 A rms current (I_{prms}). The PMMC instrument used has 1200 Ω coil resistance and 500μA of FSD (I_{mav}), and the current transformer has N_S = 7000 and N_P = 10. Silicon diodes are used and the meter series resistance is R_S = 150 kΩ. Determine the required secondary shunt resistance value (R_L). $I_L R_L = I_m (R_s + R_m) + 2V_f$

(14) A rectifier AC ammeter has the following components: PMMC instrument with FSD of 200 μA (I_{mav}), and Rm =900 Ω, current transformer with Ns = 600 and Np = 50, diodes with V_f = 0.7V, meter series resistance R_S =270 KΩ, transformer secondary shunt resistance R_L= 98.7 kΩ. Calculate the level of transformer primary current for instrument FSD.

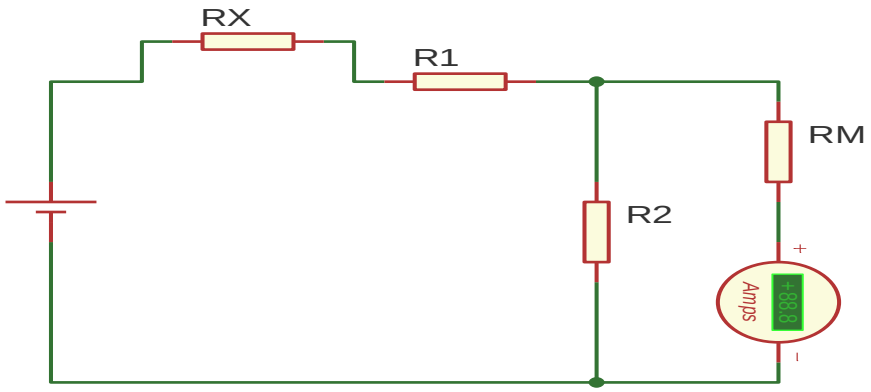
(15) A basic series ohmmeter is made up of a 3V battery, PMMC meter and a resistance R1 which made (R_1+R_m=20 kΩ). Draw the circuit diagram then determine:

a) The instrument indication (I_{mFSD}) when R_X = 0 Ω.

b) How the resistance scale should be marked at 0.5FSD, 0.25FSD and 0.75FSD.



(16) A series ohmmeter is made up of a supply voltage V_B=3V series resistor R_1=30kΩ, meter shunt resistance R_2=50Ω , meter FSD=50μA and a meter resistance Rm=50Ω. Determine the resistance measured at 0, 0.5, 0.25, and 0.75 of FSD.



(17) For the series ohmmeter circuit in problem (16) "VB = 3V series resistor R1=30kΩ, meter shunt resistance R2=50Ω, meter FSD=50μA and a meter resistance Rm=50Ω". Determine the new resistance to which R2 must be adjusted when V_B falls to 2.5V; also determine the new resistance measured at 0.5, 0.75 of FSD.

(18) Using a 3 V battery together with a meter that has 1mA FSD and a coil resistance of 50Ω, design a series ohmmeter to have measured resistance = 2kΩ at half scale deflection.