國立成功大學

111學年度碩士班招生考試試題

編　號：172

系　所：電機工程學系

科　目：電儀表學

日　期：0219

節　次：第 2 節

備　註：可使用計算機

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) Figure 1 is a parallel-type DC analog ohmmeter. $I_{m,o.c}$ and $I_{m,Rx}$ represent the current reading of meter M1 when unknown Rx is disconnected (O.C.) and connected. Find Rx in terms of $I_{m,o.c}$, $I_{m,Rx}$ and Rm. (You may make some simplified assumption)

Figure 1
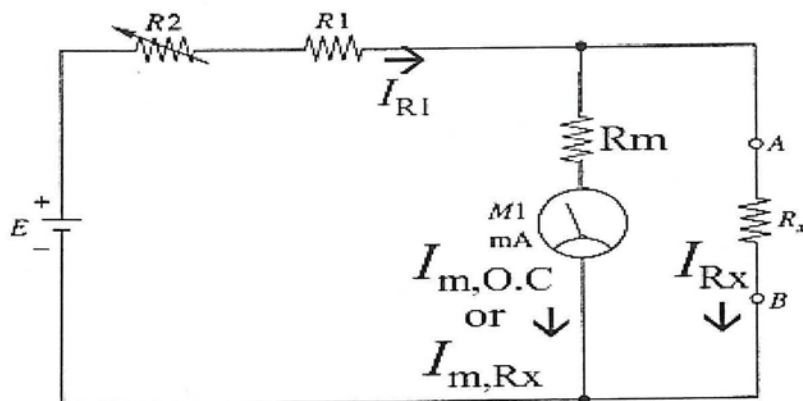
2. (15%) Given A=6±0.2, B=3±0.3, C=1±10%, and D=3±5%, please estimate the value A*B/(C+D) with absolute error in expression.

3. (15%) Explain the terminologies, mark correct/wrong, or the difference of the following terms: (a) dBm is a voltage unit (Yes/No)? (b) Null measurement; (c) Difference between accuracy and precision; (d) Theoretical errors; (e) Measurand.

4. (20%) The function of circuit in Figure 4 is a full-wave rectifier. Let $v_i = 10\sin(2\pi t)$ and $R_3 = R = 10\,k\Omega$. (a) Assume $x = 0.5$. Plot the waveform of v_o; (b) plot the relationship of v_o and v_i; (c) derive the formula of v_o in function of v_i and x. ($v_o = f(v_i, x)$, $f = ?$) (d) In positive half cycle, indicate which two diodes from $D_1/D_2/D_3/D_4$ are ON. (e) If the output voltage of the 'positive' cycle is $v_o = +5v_i$, please design the value of x. (Vcc and Vee of the OP amplifiers is 15V and -15V, respectively)
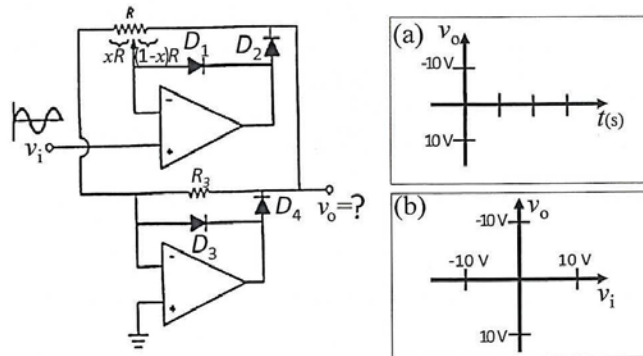

Figure 4

5. (15%) Given a frequency counter, if a five-digit Decimal Counting Assemblies (DCA) reads '08211' and the time base is set to 1 ms, (a) what is the frequency of a signal in hertz? (b) What is its period (T) in second? (c) What is the maximum measurable frequency by using this 5-digit DCA frequency counter?

6. (15%) Peak Inverse Voltage (PIV) is the maximum voltage that a diode can withstand in the reverse direction without breaking down and starting to conduct. Let $V_D = 0.7$ V. (a) Is Figure 6(a) a full-wave rectifier or half-wave rectifier? (b) Is Figure 6(b) a full-wave rectifier or half-wave rectifier? (c) Please calculate PIV of circuit in Figure 6(a). (d) Please calculate PIV of circuit in Figure 6(b). (e) In which circuit should the diodes suffer larger PIV? (a) or (b).
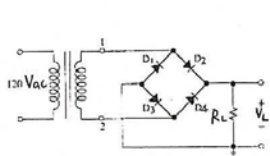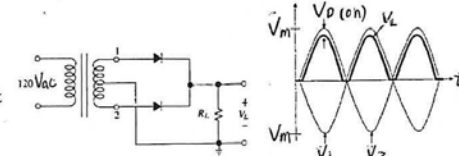

Figure 6(a)　　　　　　　　　　　　　Figure 6(b)