國立成功大學

115學年度碩士班招生考試試題

編　號：124

系　所：電機工程學系

科　目：電儀表學

日　期：0203

節　次：第 2 節

注　意：1.可使用計算機
2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. (15%) As Fig. 1 displays, assumed the PMMC meter's accuracy is ±2% as the pointer stays at 200 uA, and the full scale is 400 uA. Please find the accuracy at I_{FSD} and the relative error of measuring an unknown resistance (R_x) with this PMMC meter when $I_m = 0.75\ I_{FSD}$.

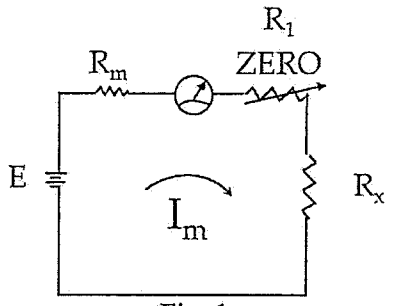

Fig. 1

2. (15%) For a Half-wave Average-Reading circuit as Fig. 2 shown, $R_m = 330\ \Omega$, $I_{FSD} = 150$ uA, $V_D = 0.7$V, find R_S for full-scale 3.3 V_{rms} range.

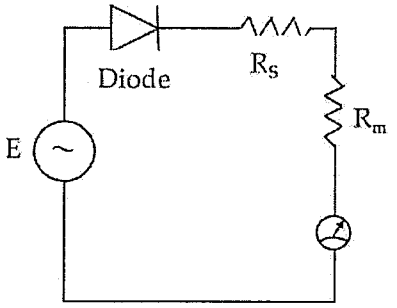

Fig. 2

3. (20%) As Fig. 3 illustrates, a Wheatstone Bridge with P=2 kΩ, Q=3 kΩ, S=1.5 kΩ, E=10 V, minimum adjustable ΔS=±0.3 Ω, Rm=0.5 kΩ, and I_G(min)=1uA. Find the resolution of the Wheatstone Bridge when measuring unknown resistance R.

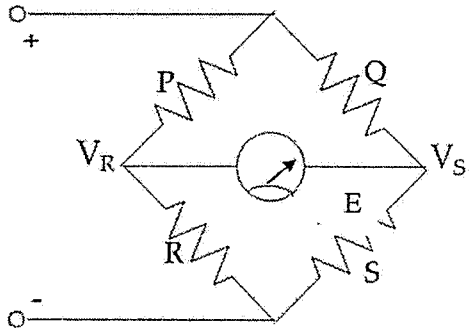

Fig. 3

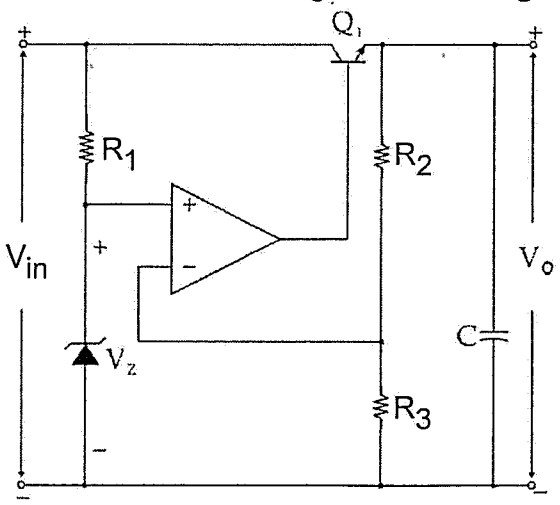

Fig. 4

4. (20%)As Fig. 4 illustrates, the input voltage (V_{in}) is 20 V. The breakdown voltage of the Zener diode (V_Z) is 4 V when its current is 10 mA, and V_Z increases to 4.05 V when its current increases to 20 mA. In addition, $R_2 = 4$ kΩ and $R_3 = 8$ kΩ. (a) (4%) What is the function of this circuit? (b)(6%) Please calculate the dynamic resistance of the Zener diode (i.e., its equivalent resistance at its quiescent operating point. (c)(5%) Please calculate its output voltage (V_O) when the current of the Zener diode is 10 mA. (d)(5%) Please calculate the value of R_1 to make $V_Z = 4$ V.

5. (15%) The block diagram of Superheterodyne Spectrum Analyzer is shown below (Fig. 5). (a) (5%) Explain the operations of figure below. (b) (5%) Show the output spectrum of the mixer. (c) (5%) If f_S is 2 GHz, f_{LO} sweeps from 4 to 7 GHz, and the waveform of LCD display is shown in figure, please plot the corresponding IF filter.

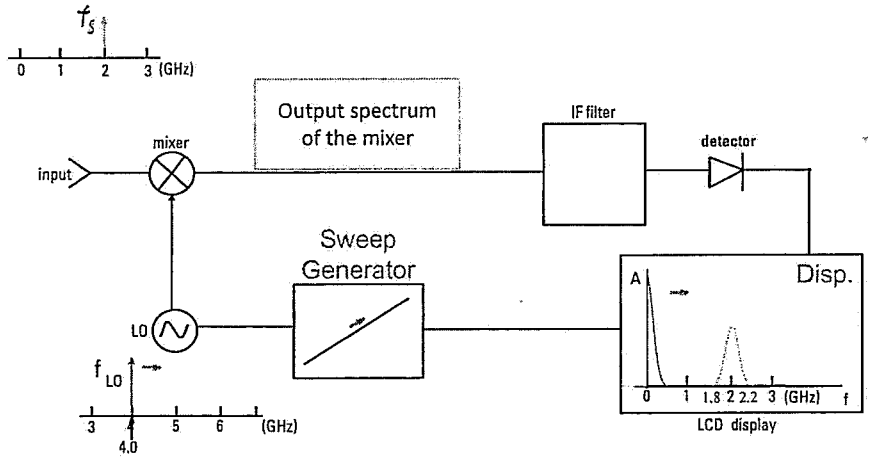

Fig. 5

6. (15%) The Q-meter circuit in Fig. 6 is in resonance when $E = 100$ mV, $R = 5\ \Omega$, and $|X_L| = |X_C| = 200\Omega$. Calculate the Q of the coil and the voltmeter (V_C) indication.

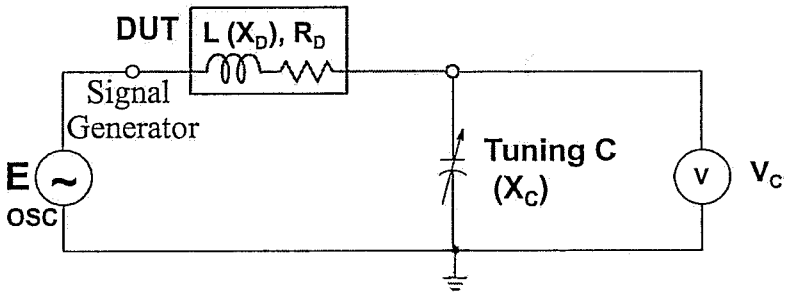

Fig. 6