# 國立成功大學

# 114學年度碩士班招生考試試題

編　號：104

系　所：系統及船舶機電工程學系

科　目：電子學

日　期：0210

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。

一、選擇題: (20 分，每題 2 分)

1. The atomic number is the number of

    a. protons in the nucleus

    b. neutrons in the nucleus

    c. protons plus neutrons in the nucleus

    d. electrons in the outer shell

2. Valence electrons are

    a. in the outer shell

    b. involved in chemical reactions

    c. relatively loosely bound

    d. all of the above

3. The atomic particle responsible for electrical current in solid metallic conductors is the

    a. proton

    b. electron

    c. neutron

    d. all of the above

4. For constant voltage in a circuit, doubling the resistance means

    a. halving the current

    b. doubling the current

    c. there is no change in the current

    d. depends on the amount of voltage

5. Holding the voltage constant, and plotting the current against the resistance as resistance is varied will form a

    a. straight line with a positive slope

    b. straight line with a negative slope

    c. hyperbola

    d. parabola

6. A battery stores

    a. electrons

    b. protons

    c. ions

    d. chemical energy

7. The unit of conductance is the

    a. ohm

    b. coulomb

    c. siemen

    d. ampere

8. A four-color resistor with the color bands gray-red-black-gold is
   a. 73 Ω
   b. 82 Ω
   c. 680 Ω
   d. 820 Ω
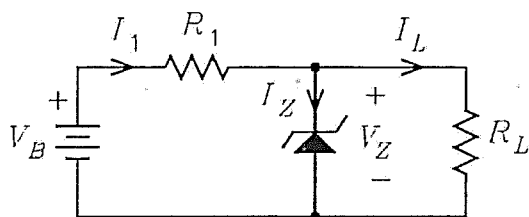
9. A 330 kW ± 5% resistor has the color bands
   a. red-red-brown-gold
   b. orange-orange-yellow-gold
   c. yellow-yellow-red-gold
   d. yellow-yellow-green-gold

10. The circular mil is a unit of
    a. length
    b. resistance
    c. volume
    d. area

二、計算題: (80 分)

1. The figure shows a Zener diode regulator circuit. It is given that $V_B = 45$ V, $V_Z = 24$ V, $I_Z = 5$ mA, $r_Z = 20$ Ω, $R_L = 12$ kΩ. (25 分，每小題 5 分)



   (a) In the large signal model of the Zener diode, what is the voltage $V_{Z0}$?
   (b) What is the values of $I_L$ and $I_1$?
   (c) What is the required value of $R_1$?
   (d) Calculate the power dissipated in $R_1$, in the Zener diode, and in $R_L$.
   (e) If the load current doubles, calculate the decrease in the voltage across the Zener diode.

2. The figure shows a MOSFET circuit. It is given that $V^+ = 18$ V, $R_1 = 7.5$ kΩ, $R_2 = 500$ Ω, $K = 0.001$ A/V$^2$, and $V_{TH} = 1.5$ V. (25 分)
   (a) Find the value of $V_1$ required to obtain a drain-to-source voltage of 10 V. (20 分)
   (b) Calculate the power dissipation in the MOSFET. (5 分)
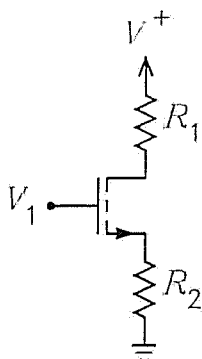
3. A half-wave rectifier is shown. It is given that $v_S(t)$ is a 60 Hz sinusoidal voltage with an rms value of 24 V. When the diode is forward biased, its voltage drop is $V_{D0} = 0.6$ V. The circuit values are $R_L = 200$ $\Omega$ and $C = 1000$ μF. (30 分，每小題 10 分)

   (a) Calculate the peak load voltage.

   (b) Calculate the maximum reverse bias voltage across the diode.

   (c) The percent ripple is given by % ripple $= [1 - \exp(-T/R_L C)] \times 100\%$. When the diode is off, what is the lowest value that the load voltage can "droop" to before the diode conducts again?