

中原大學 94 學年度博士班入學考試

6 月 8 日 8:30~10:00 電子工程學系甲組

誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

科目：基本專業能力測驗

(共 3 頁第 1 頁)

可使用計算機，惟僅限不具可程式及多重記憶者 不可使用計算機

固態、數位、通訊共 9 題，任選 5 題，滿分 100 分，請標明項次題號。一律依考生答題順序評分，答題超過規定題數之部份不予計分。

(固態領域)

1. (a) Do you think that most of the transparent solids are not good electrical conductors? Please explain your answer. (b) If you need a good transparent conductor, how are you going to do? (20%)
2. (a) How do you determine whether an unknown solid is a metal or a semiconductor using a simple method? (b) Choose one of the following materials to make a thermoammeter (temperature meter): pure Si, pure Ge, n-type Si, n-type Ge, p-type Si and p-type Ge. Explain why you choose the material and how you will make it. (Note: the energy gaps of Si and Ge are 1.1eV and 0.67eV, respectively.) (20%)
3. Sketch and compare the I-V curve for a normal p-n diode and a Schottky diode (metal-semiconductor diode) in the forward bias and reverse bias region. (b) Sketch and compare the I-V curve in the forward and reverse bias region for a normal long p-n diode (in which both p- and n- regions are long compared with the minority carrier diffusion lengths) and a short p-n diode. (20%)

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科目：基本專業能力測驗

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固態、數位、通訊共 9 題，任選 5 題，滿分 100 分。

(數位組)1. A logic implementation is show in Fig. 1.

If $A = 0, B = 1, \bar{C} = 1, D = 0, \bar{E} = 1$, find the value of Y . (20%)

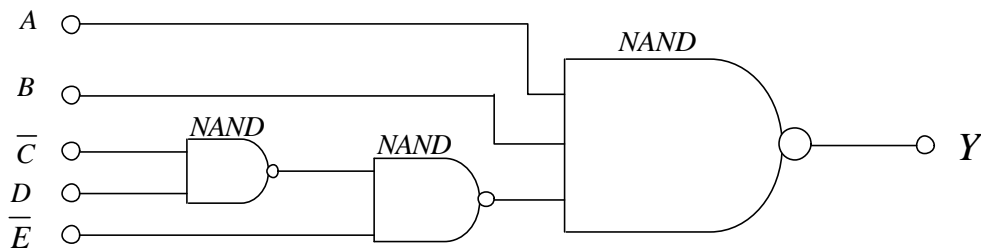


Fig. 1.

(數位組)2. Using the KCL(Kirchhoff's current law) to find the node equations of nodes 1 and 2 for the circuit shown in Fig. 2. (20%)

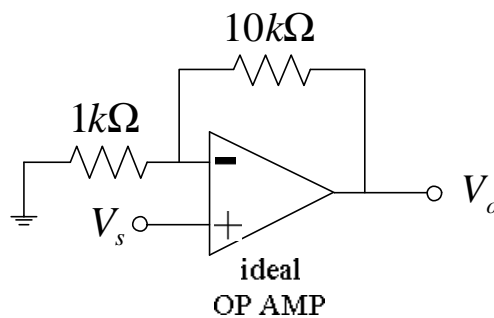
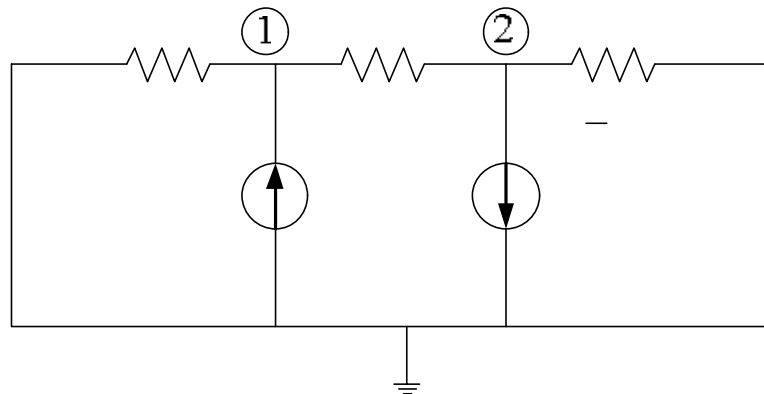


Fig. 3.

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(通訊組)

1. A binary modulated signal can be represented as

$$s(t) = Am(t) \cos(2\pi f_c t) \quad 0 \leq t \leq T$$

where A is a constant, f_c is the carrier frequency, and T is the bit duration.

(a.) give the parameters of $m(t)$ to represent a BASK (on-off signal) and BPSK, respectively. (5%)

(b.) plot constellation diagram of both BASK and BPSK signals. (5%)

(c.) which one has the better performance? Why? (10%)

(通訊組)

2. (a.) Define what is meant by inter-symbol interference (ISI) in a digital transmission system. (3%)

(b.) Briefly plot a diagram to show how does it affect digital transmission? Assuming a data sequence, 1,-1,1,1,-1, which we wish to send. (3%)

(c.) Briefly outline the varying methods which can be used to reduce the effect of ISI. (14%)

(通訊組)

3. (a.) Why is Gray coding used in multi-level digital modulation schemes? (3%)

(b.) given an equation to represent M-ary Quadrature amplitude modulated waveform? (3%)

(c.) plot the constellation diagram of 16-QAM according to a Gray code. (14%)