

华东师范大学期末试卷 (A)

2007—2008 学年第二学期

课程名称: 软件工程数学

学生姓名: _____

学 号: _____

专 业: _____

年级/班级: _____

课程性质: 专业必修

| 一 | 二 | 三 | 四 | 五 | 六 | 七 | 八 | 九 | 十 | 十一 | 十二 | 总分 | 阅卷人签名 |
|---|---|---|---|---|---|---|---|---|---|----|----|----|-------|
| | | | | | | | | | | | | | |

一、(7 分)

Show the following statement.

Premises: $(\exists x)A(x) \rightarrow (\forall x)((B(x) \vee A(x)) \rightarrow C(x))$, $(\exists x)A(x)$

Conclusion: $(\exists x) C(x)$

二、(8 分)

集合 $S=\{1,2,3,4,6,8,12\}$ 上的整除关系 $|$, $\langle S, | \rangle$ 为偏序关系

(1) 画出它的哈斯图 (Hasse)。

(2) 找出 S 的极大元, 极小元, 最大元和最小元。

三、(10 分)

1.

How many strings of three decimal digits

(a) begin with an even digit?

(b) end with two odd digits?

(c) begin with an even digit or end with two odd digits?

2. How many permutations of the digits 0123456 contain both strings 12 and 56?

四、(8 分)

Show that among any $n+1$ positive integers not exceeding $2n$ there must be an integer that divides one of the other integers.

五、(6 分,)

Use the binomial theorem

$$(x+y)^n = \sum_{k=0}^n C(n,k)x^{n-k}y^k$$

to prove the following equation, where n is a positive integer

$$C(n,0) + C(n,2) + C(n,4) + \dots + C(n,n) \\ = C(n,1) + C(n,3) + C(n,5) + \dots + C(n,n-1)$$

六、(8 分)

How many solutions are there to the equation $x_1 + x_2 + x_3 + x_4 = 21$, where

$x_i, i=1,2,3,4$, is nonnegative integer such that

(a) $x_i \geq 4$ for $i=1,2,3,4$?

(b) $0 \leq x_1 \leq 10$ and $0 \leq x_4 \leq 6$? (要求计算出具体的数值)

七、(6 分)

(a) A computer system considers a string of decimal digits a valid codeword if it contains an even number of 0 digits. For instance, 1230407869 is valid, whereas 120987045608 is not. Let a_n be the number of valid n -digit codeword. Find a recurrence relation for a_n .

(b) What are the initial conditions?

八、(12 分)

1. 解下列递推关系

$$a_n = a_{n-1} + 9a_{n-2} - 9a_{n-3}$$

$$a_0 = 0, a_1 = 1, a_2 = 2$$

2. What is the generating form of a particular solution of the linear nonhomogeneous recurrence relation?

$$a_n = 8a_{n-2} - 16a_{n-4} + F(n) \quad \text{if}$$

a) $F(n) = n^3$? b) $F(n) = (n^2 - 2)(-2)^n$? c) $F(n) = n^4 2^n$?

九、(4 分)

把正整数 8 写成三个非负整数 n_1, n_2, n_3 的和, 要求 $1 \leq n_1 \leq 4$, $n_2 \leq 3$, $n_3 \leq 6$ 。我们可以用生成函数来确定相应的不同的“写法”, 生成函数中的 x^8 的系数就是我们所要求的“写法”的个数。

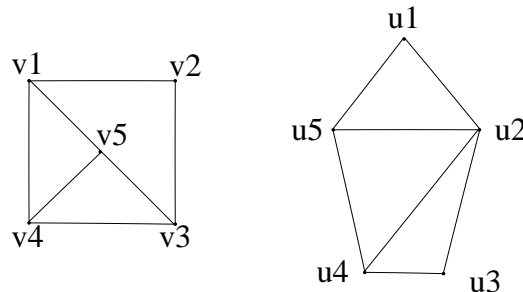
请构造相应的生成函数。

十、(16 分)

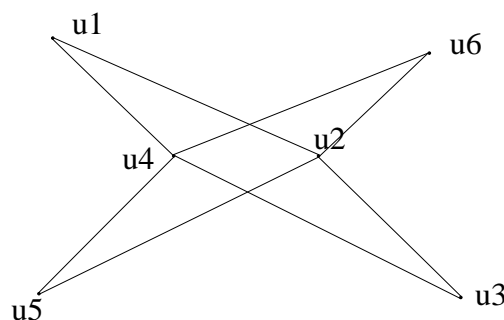
1. Does there exist a simple graph with seven vertices of these degrees? If so, draw such a graph.

4, 1, 2, 2, 2, 3, 4

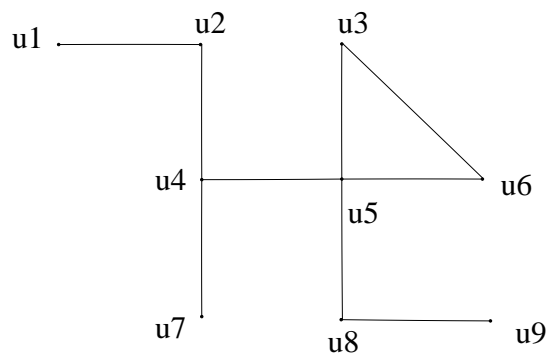
2. Determine whether the given pair of graphs is isomorphic(同构). Please briefly explain the reason.



3. Determine whether the graph is bipartite.



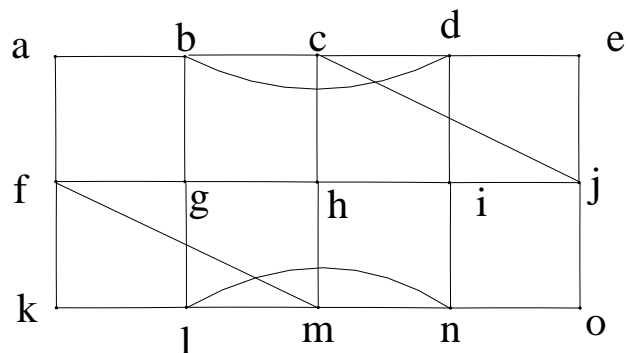
4. Find all the cut edges of the given graph.



十一、(8 分)

1. What is the chromatic number of W_n ? (W_n 表示在 C_n 的中心加一个顶点, 该顶点与其它各个顶点都有边相连)

2. Determine whether the given graph has an Euler circuit. Construct such a circuit when it exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such a path if it exists.



十二、(7 分)

Prove the following graph is nonplanar (非平面).

