

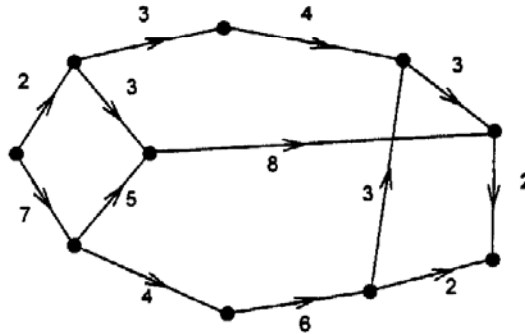
國立臺灣科技大學  
八十八學年度碩士班招生考試試題

系所別：電機工程系碩士班

組別：丙組

科目：離散數學

1. Use the labeling procedure to find a maximum flow in the transport network in the figure shown below. (10%)



2. Show that  $C(n, 0) + C(n, 1) + \dots + C(n, r) + \dots + C(n, n) = 2^n$  (20%)

3. (a) In how many ways can we make up the pattern

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X
X
X X X X X
X
X

```

with 0s and 1s? (10%)

- (b) How many of these patterns are not symmetrical with respect to the horizontal axis? (10%)

4. Suppose  $S$  and  $T$  are two sets and  $f$  is a function from  $S$  to  $T$ . Let  $R_1$  be an equivalence relation on  $T$ . Let  $R_2$  be a binary relation on  $S$  such that  $(x, y) \in R_2$  if and only if  $(f(x), f(y)) \in R_1$ . Show that  $R_2$  is also an equivalence relation. (10%)

5. A code for  $\{a, b, c, d, e\}$  is given by  $a:00$   $b:01$   $c:101$   $d:x10$   $e:yz1$ , where  $x, y, z \in \{0, 1\}$ . Determine  $x, y$ , and  $z$  so that the given code is a prefix code. (10%)

6. A three-state finite state machine has  $\{0, 1\}$  as its input and output alphabets. Given the following input sequence and its corresponding output sequence, determine the machine. (10%)

Input sequence	0	0	0	1	0	1	0	1
Output sequence	0	1	1	0	0	1	1	1

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7. (True/False) Indicate true or false of the following statement and give a brief explanation or a counterexample for your judgement. (No credit if no explanation). (20%)

- (a) A regular binary tree has an even number of vertices.
- (b) Any edge of a connected graph  $G$  is a branch of some spanning tree of  $G$ .
- (c) Any edge of a connected graph  $G$  is a chord of some spanning tree of  $G$ .
- (d) There is a self-complementary graph with 3 vertices.