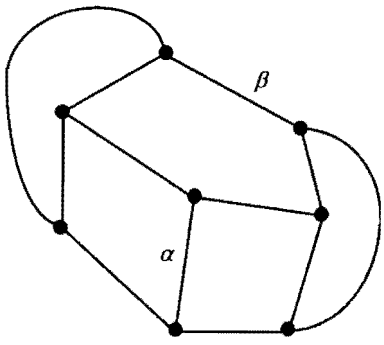
國立雲林科技大學
101 學年度碩士班暨碩士在職專班招生考試試題

系所：資工系
科目：離散數學

1. Show that any Hamiltonian cycle in the following graph that contains the edge α must also contain the edge β. (10%)



2. Solve the recurrence relation and find the value of a_{16}, where $a_{n+1}^2 = 5a_n^2, a_n \geq 0, a_0 = 3$. (15%)

3. Determine the generating function for the sequence: **0, 0, 1, 0, 0, 1, 0, 0, 1, ...** (15%)

4. **(a)** If the **in-order** and **post-order** results of a binary tree T are **CBFDGA** and **CFGDBA**, respectively, please determine the binary tree T, where {A,B,C,D,E,F,G} are tree nodes. (5%)
(b) Meanwhile, list the **pre-order** of the binary tree T. (5%)

5. The population of Olympia is approximately 18, 273. Show that at least two people in Olympia have the same initials. (Note that some people do not have middle names.) (5%)

6. Define the relation R on Z to be a R b if a – b is prime. Is R reflexive? Symmetric? Transitive? Explain why! (5%)

7. Let Σ = {a, b, c, d, e}. (a) What is |Σ2|? |Σ3|? (b) How many strings in Σ* have length at most 5? (8%)

8. Verify that the expression $(p \Rightarrow q) \Leftrightarrow (\neg p \vee q)$ is a tautology. (7%)

9. Write a Turing machine that, when run on the tape (8 %)

... b 1 1 1 0 b ...

will produce an output tape of

... b 1 1 1 0 1 b ...

10. Consider the open statement (10 %)

$p(x,y)$: $y - x = y + x^2$

where the universe for each of the variables x, y comprises all integers. Determine the **True** or

False value for each of the following statements:

A) $p(0,1)$ **B)** $\forall y\, p(0,y)$ **C)** $\exists y\, p(1,y)$

D) $\forall x\, \exists y\, p(x,y)$ **E)** $\exists y\, \forall x\, p(x,y)$

11. Please minimize the finite state machine shown below. (7%)

	Next State		Output	
	0	1	0	1
S_1	S_4	S_3	0	0
S_2	S_5	S_2	1	0
S_3	S_2	S_4	0	0
S_4	S_5	S_3	0	0
S_5	S_2	S_5	1	0
S_6	S_1	S_6	1	0