

國立彰化師範大學104學年度碩士班招生考試試題

系所： 資訊工程學系

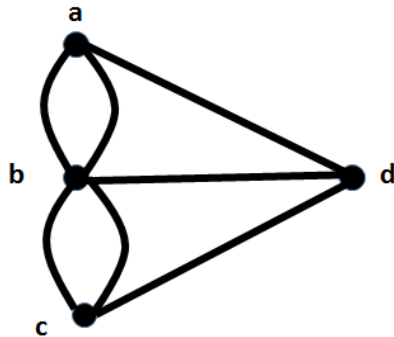
選考乙

科目： 離散數學

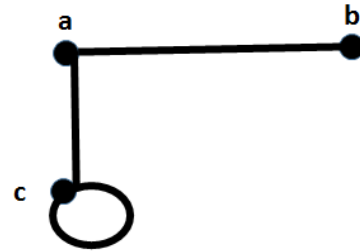
☆☆請在答案紙上作答☆☆

共 2 頁，第 1 頁

1. What is the *connectivity* and *edge connectivity* for the graphs (a) and (b)? (4%)



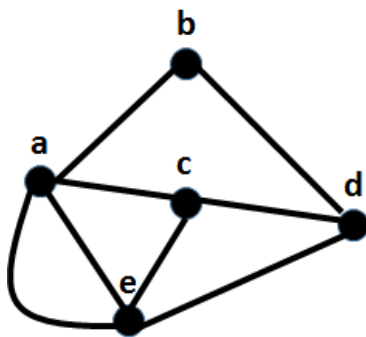
(a)



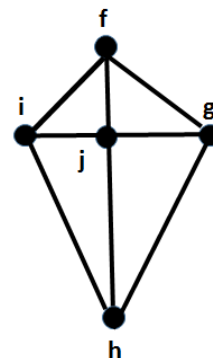
(b)

2. Produce the *adjacency matrix* for the graphs (a) and (b), use the natural ordering for the vertices. (6%)

3. Are the following two graphs *isomorphic*? Provide sufficient justification for your answer. (10%)



(c)



(d)

4. Define a relation R on $\mathbf{Z} \times \mathbf{Z}$ by $(a, b) \in R$ if and only if $a-b$ is an *even* integer. (10%)

(a) Show that R is an *equivalence relation*.

(b) Describe the equivalence classes.

5. What are the solutions of the linear congruence $3x \equiv 4 \pmod{7}$? (5%)

6. Compute $\gcd(12345, 54321)$. (5%)

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7. Find the *zero-one* matrix of the *transitive closure* of the relation R

$$\text{where } M_R = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix} \quad (10\%)$$

8. Construct the Truth Table of the compound proposition $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$. (5%)

9. What is the coefficient of x^{10} in $(x + \frac{1}{x})^{20}$? (5%)

10. Let $A = \{\emptyset, a, \{\emptyset\}\}$ and $B = \{a, b\}$. (10%)

(a) $A-B = ?$

(b) $A \oplus B = ?$

(c) What is the power set of A ?

11. Prove that if n is a positive integer, then 133 divides $11^{n+1} + 12^{2n-1}$. (10%)

12. Find the solution to each of these recurrence relations and initial conditions. (10%)

(a) $a_n = a_{n-1} + 2n + 3, a_0 = 4.$

(b) $a_n = na_{n-1}, a_0 = 5.$

13. How many solutions are there to the equation: $x_1 + x_2 + x_3 + x_4 + x_5 = 21$, where $x_i, i = 1, 2, 3, 4, 5$, is a nonnegative integer such that (10%)

(a) $x_1 \geq 1$?

(b) $0 \leq x_1 \leq 10$?