

EASTERN UNIVERSITY , SRI LANKA

EXTERNAL DEGREE FIRST EXAMINATION IN SCIENCE(2003/2004)

SECOND SEMESTER (October,2007)

EXTCS 106 – Computer Organization and Architecture

(Proper & Repeat)

Answer all question

Time: Two hours

Question 1.

- (i) If a computer is a single-addressed computer, word addressed, has 64 operation codes and 16k address. Answer the following:
- (a) What is the length of the instruction register ?
 - (b) How many bits are there in the PC register ?
 - (c) What is the length of ACC register? (30marks)
- (ii) Define what is meant by a *bus*?
What are the functions of the following :
- (a) Data bus, (b) Address bus, (c) Control bus. (30marks)
- (iii) Discuss the interrupt servicing procedure to cater to the I/O read/write operation. (20marks)
- (iv) What is the purpose of having a cache memory in a computer system? (20marks)

Question 2

- (i) Explain with the aid of a diagram, the terms, *cache hit* , and *cache miss*. (20marks)
- (ii) Describe the procedure used to transfer a word in DMA mode. (20marks)
- (iii) Explain what is meant by *cycle stealing*? (20marks)
- (iv) What are De Morgan's theorems? (20marks)
- (v) What is a truth table ? What is its significance? (20marks)

Question 3.

(a)

(i) State the Distributive Laws of Boolean Algebra. Explain how do they differ from the Distributive Laws of ordinary algebra? (10marks)

(ii) Find the complement of the following Boolean function $Y = AB' + C'D'$. (10marks)

(iii) Draw logical circuit diagram for the following expression.

$$Z = ab + \overline{bc} + \overline{ca}$$

(iv) Prove that $X.(X+Y) = X$, by using a truth table. (10marks)

(b) Give the duals for the following:

(i) $X + \overline{XY}$ (ii) $XY + \overline{X} + \overline{X}Y$ (iii) $(A+0).(A.1.\overline{A})$ (IV) $AB + \overline{A}B$.

(c) Obtain a simplified form for a Boolean expression

$$F(u, v, w, z) = \Sigma(0, 1, 3, 5, 7, 9, 10, 11, 12, 13, 14, 15)$$
 using Karnaugh Maps. (20marks)

(d) Draw the logic circuit for a *Half Adder* using *NAND* gates only. (20marks)

Question 4.

Prove the following without using the truth table:

a) $(X+Y).(X+Z) = X+Y.Z$. (20marks)

b) $\overline{X}.Y.\overline{Z} + \overline{X}.Y.\overline{Z} + X.Y.\overline{Z} + X.Y.\overline{Z} = \overline{Z}$. (20marks)

c) $\overline{A}.\overline{(B+C)}.\overline{(A+B)} = \overline{A}.\overline{B} + \overline{A}.\overline{C}$. (20marks)

d) Draw a *full adder* using *half adders*. (20marks)

e) Draw a *parallel adder*. (20marks)