



NATIONAL INSTITUTE OF BUSINESS MANAGEMENT
Higher National Diploma in Computer Based Information System 17.2F
Higher National Diploma in Software Engineering 17.2F
Computer Architecture HDCBIS-2-3-06/HDSE-2-3-06

Date: 08.05.2018

Answer **all** questions

Time: 3 hours

Additional Requirements: PICmicro MID-RANGE MCU FAMILY Instruction Set

1.

- a. What is stack memory? (03 Marks)
- b. Explain the sub program implementation with an example. (04 Marks)
- c. Draw the stack diagram based on the following Assembly Program. (05 Marks)

Main Program	Sub Program
	200 Sub P(x,y,z)
100 P(2,4,8)	201 Q(y+3)
101 ----	202 End Sub
	300 Sub C(a)

	305 End Sub
	500 Sub Q(s)
	501 C(13)
	502 End Sub

- d. Explain memory indirect addressing mode used in memory access. (03 Marks)
- e. Encode the text "Never come back" using Huffman encoding technique. (05 Marks)

(20 Marks)

2.

- a. Explain the importance of cache memory in a computer system. (02 Marks)
- b. In a given computer system with cache hit ratio (H) of 60% can access cache memory in 5ns and main memory in 50ns. Calculate the average memory access time in the system. (03 Marks)
- c. Consider a machine with a byte addressable main memory of 8GB and block size of 2KB. Assume that a direct mapped cache with 32MB capacity is used in this machine.
 - i. Explain direct cache placement algorithm. (02 Marks)
 - ii. Draw the physical address format used to access main memory and cache memory.(05 Marks)
 - iii. What is the requirement for a tag to access cache memory? (02 Marks)
 - iv. Calculate the tag directory size required in this system. (01 Marks)
- d. Explain the cache replacement algorithms possible to use when replacing cache data.(03 Marks)
- e. What is a cache write policy? (02 Marks)

(20 Marks)

3.

- a. Explain the Motorola 68k family processor architecture? (04 Marks)
- b. Draw the general instruction format for 'Byte-oriented file register operations' in "PICmicro MID-RANGE MCU FAMILY instruction set". (03 Marks)
- c. Determine the assembly code for the following high-level operation based on "PICmicro MID-RANGE MCU FAMILY instruction set" where X, Y and Z are stored in 20, 21 and 22 memory locations respectively. (06 Marks)

$$Z = XY * (X^2 - 2Y)$$

- d. Explain the types of interrupts possible in a computer system. (03 Marks)
- e. Compare and contrast traditional computer systems and modern computer systems. (04 Marks)

(20 Marks)

4.

- a. What are the possible instruction formats in a modern computer system? (03 Marks)
- b. What is a Complex Instruction Set Computer? Explain with an example. (03 Marks)
- c. Write an assembly programs using Zero, One, Two and Three operand instruction for the following high-level statement. (08 Marks)

$$Z = X^2 + 3Y / (2X^2 - 2Y)$$

- d. Draw the stack diagram for the execution of Zero assembly instruction program of the question given above. (04 Marks)
- e. What are the data processing techniques used in multiprocessor system? (02 Marks)

(20 Marks)

5.

- a. What is pipelining? (02 Marks)
- b. What is the relationship between pipeline stages and the speedup factor of a pipeline? (03 Marks)
- c. A Computer program with 300 instructions to be processed in a 5 stage pipeline processor and it takes 3ns for each instruction for the completion.
 - i. What is the serial execution time for the program? (02 Marks)
 - ii. What is the parallel execution time for the program? (02 Marks)
 - iii. What is the speedup factor? (02 Marks)
- d. A processor with five stages pipeline has 3GHz clock rate. MIPS rate in parallel processing is 2500.
 - i. Calculate the MIPS rate in serial execution. (02 Marks)
 - ii. What is the possible internal pipeline delay % in the system? (03 Marks)
- e. What are the possible hazards in a pipeline and what solutions can be provided to overcome pipeline hazards? (04 Marks)

(20 Marks)