

# Mechatronics and Microprocessors VTU Question Paper Set 2017

VTU CAMPUS APP



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10ME65

**Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017**  
**Mechatronics and Microprocessor**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART – A**

- 1
  - a. Define Mechatronics. With a block diagram, briefly explain the generalized measurement system. (07 Marks)
  - b. State and explain functions of basic elements of a closed loop control system, with a block diagram. (06 Marks)
  - c. Explain with a diagram, the working of an Engine Management system. (07 Marks)
- 2
  - a. Define Sensors and Transducers. Name any three types of sensors and transducers each. (08 Marks)
  - b. State and explain the working principle of Hall Effect sensor. (06 Marks)
  - c. What are proximity sensors? Explain capacitive proximity sensor, with a neat diagram. (06 Marks)
- 3
  - a. With sketch, explain solenoid and state its uses. (06 Marks)
  - b. Explain the working principle of a permanent magnet DC motor. How it is used for positive control drive. (08 Marks)
  - c. Sketch and explain the working of a stepper motor. (06 Marks)
- 4
  - a. Define signal conditioning. What are the necessity of signal conditioning? (05 Marks)
  - b. Define the following filters with frequency versus gain curve :  
 i) Low pass    ii) High pass    iii) Band pass    iv) Band stop. (10 Marks)
  - c. What are the characteristics of an ideal operational amplifier? (05 Marks)

**PART – B**

- 5
  - a. Discuss briefly with a block diagram, organization of a typical microcomputer system. (08 Marks)
  - b. State Demorgan's theorems. Also draw logic circuits for the same. (06 Marks)
  - c. With the help of symbols and truth table, explain NOR and NAND gates. (06 Marks)
- 6
  - a. Explain with neat sketch, the architecture of INTEL 8085 microprocessor. (12 Marks)
  - b. What is a Microcontroller? How are microcontrollers classified? Briefly explain each. (08 Marks)
- 7
  - a. Explain the following terminology related to microprocessor :  
 i) Program counter    ii) Flag register    iii) Stack pointer    iv) Accumulator. (08 Marks)
  - b. Explain the flow of instruction sets of a 8085 microprocessor. (08 Marks)
  - c. List out the functions of ALU. (04 Marks)
- 8
  - a. Define CPU and state its functions. (06 Marks)
  - b. How instructions and data flow occurs in microprocessors? (08 Marks)
  - c. Define the following :  
 i) System clock    ii) System clock frequency  
 iii) Clock period    iv) Memory access time. (06 Marks)

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important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.



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10ME65

**Sixth Semester B.E. Degree Examination, June/July 2016**  
**Mechatronics and Microprocessor**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART - A**

- 1 a. What are the basic functions of control system? Mention the requirement of it in detail. (06 Marks)  
 b. What are the benefits of mechatronics in industries? (06 Marks)  
 c. Draw the structure of a programmable logic controller and mention the functions of each block. (08 Marks)
  
- 2 a. A potentiometer resistance transducer has a total winding resistance of  $8K\Omega$  and a maximum displacement range of 5cm. The power dissipation at maximum displacement is not to exceed 50 mW. Determine the output voltage of the transducer when the input displacement is 2cm. (06 Marks)  
 b. What are position sensors? Explain the working of Hall effect sensors and mention the advantages of it. (08 Marks)  
 c. Explain the operation of a linear variable differential transducer. (06 Marks)
  
- 3 a. Draw the switching arrangement of break before make and make before break. Mention disadvantages of mechanical switches. (06 Marks)  
 b. What are solenoids? What are the parameters to be consider for selecting a solenoids for an application. (06 Marks)  
 c. What is stepper motor and explain the working of a two stack stepper motor. (08 Marks)
  
- 4 a. Explain the operation of a optical isolator. (06 Marks)  
 b. For the op-amp circuit shown in Fig.Q.4(b), find the output voltage. (04 Marks)

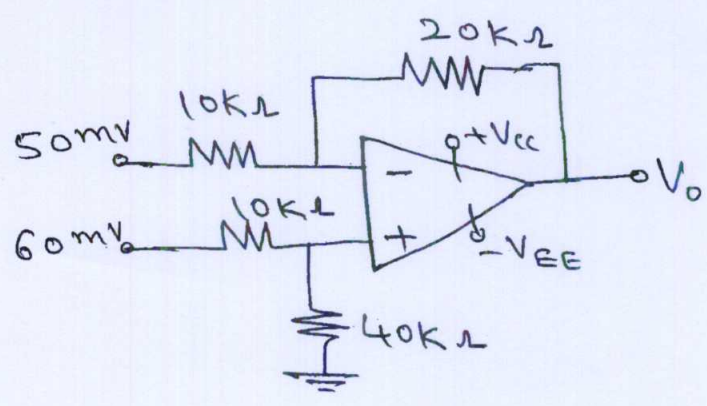


Fig.Q.4(b)

- c. Illustrate a data acquisition system. (07 Marks)
- d. What are the advantages of digital signal processing over analog signal processing? (03 Marks)

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**PART – B**

- 5 a. Convert the following:
- $(ABC)_{16} = ( \quad )_{10}$
  - $(204.2)_8 = ( \quad )_{10}$
  - $(0.60)_{10} = ( \quad )_2$
  - $(101010.101)_2 = ( \quad )_{10}$ . (08 Marks)
- b. Write a note on overflow and underflow. (06 Marks)
- c. Simplify the Boolean expression and realize using basic gates  $Y = A(\overline{ABC} + A\overline{BC})$ . (06 Marks)
- 6 a. Define the following terms with respect to microprocessor:
- Fetch cycle
  - Accumulator
  - Interrupts
  - Stack pointer
  - Write cycle. (10 Marks)
- b. Draw the block diagram of a micro controller and mention the functions of each block. (10 Marks)
- 7 a. Explain the different types of addressing modes of INTEL 8085 microprocessor with example. (10 Marks)
- b. Write a program to find the largest of N binary numbers that are stored at consecutive data memory locations starting at X. (07 Marks)
- c. What is the function of logical group of instructions and mention few of it. (03 Marks)
- 8 a. Draw the block diagram of a control unit and explain it. (10 Marks)
- b. Draw and explain the timing diagram of read operation. (10 Marks)

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10ME65

**Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Mechatronics and Microprocessor**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. Define mechatronics. What are the advantages and disadvantages of mechatronics?(05 Marks)
- b. Explain with a block diagram the working of a digital camera. (10 Marks)
- c. Discuss basic elements of a closed-loop system. (05 Marks)
- 2 a. Explain static and dynamic characteristics of sensors. (08 Marks)
- b. Explain working principle of Hall effect sensor. (06 Marks)
- c. Define following terms:
  - i) Hysteresis error
  - ii) Repeatability
  - iii) Non-linearity error (06 Marks)
- 3 a. Discuss any four solid state switches. (10 Marks)
- b. What is stepper motor? Explain various types of stepper motor. (10 Marks)
- 4 a. Explain inverting and non-inverting op-amps with a neat sketch. (10 Marks)
- b. With a neat sketch, discuss basic elements used in analog to digital converter. (10 Marks)

**PART – B**

- 5 a. State and prove De-Morgan's theorem. Also draw the logic circuit for the same. (08 Marks)
- b. Explain any six laws of Boolean algebra. (06 Marks)
- c. With the help of symbols and truth table, explain XOR and NAND gate. (06 Marks)
- 6 a. What are the differences between microprocessors and microcontrollers? (04 Marks)
- b. Explain with a neat sketch of architecture 8085 microprocessor. (10 Marks)
- c. Explain the following terminology related to microprocessor:
  - i) Interrupts
  - ii) RAM
  - iii) Assembler (06 Marks)
- 7 a. Discuss classification of instruction sets of 8085 microprocessor. (10 Marks)
- b. What are buses? Explain types of buses. (08 Marks)
- c. List any four applications of microprocessor. (02 Marks)
- 8 a. Explain with a neat diagram of the flow of data word and instrumentation word. (10 Marks)
- b. Draw and explain timing diagram for memory write operation. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
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10ME65

**Sixth Semester B.E. Degree Examination, June/July 2015**  
**Mechatronics and Microprocessor**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART – A**

- 1 a. Define Mechatronics. Briefly explain the evolution of mechatronics. (10 Marks)  
 b. What is a control system? Explain open loop and closed loop control system with suitable examples. (10 Marks)
- 2 a. How transducers are classified? (05 Marks)  
 b. Explain the following terminology : i) Accuracy ii) Repeatability iii) Sensitivity  
 iv) Time constant v) Hysteresis. (10 Marks)  
 c. With a neat sketch, explain Hall effect sensor. (05 Marks)
- 3 a. Write a symbolic representation of Thyristor and explain its characteristics. (10 Marks)  
 b. With a neat sketch, explain the principle working of a permanent magnet stopper motor. (10 Marks)
- 4 a. What is a Multiplexer? Explain with a neat sketch, Two – channel multiplexer. (10 Marks)  
 b. What is Pulse modulation? Explain the two types of modulation. (10 Marks)

**PART – B**

- 5 a. With the help of symbol and truth table, explain NOT, NAND, NOR and XOR gates. (10 Marks)  
 b. Convert the following : (10 Marks)  
 i)  $(654)_{10} = X_8$  ii)  $(11010.01101)_2 = X_{16}$  iii)  $(156.8F)_{16} = X_2$  iv)  $(2747)_8 = X_{10}$ .
- 6 a. Explain with a block diagram, the architecture of Intel 8085A processor. (14 Marks)  
 b. Enumerate the differences between microprocessor and microcontroller. (06 Marks)
- 7 a. Explain the different types of addressing modes of Intel 8085 microprocessor. (10 Marks)  
 b. Explain the following : i) Accumulator ii) Memory address iii) instruction set  
 iv) Fetch cycle. (10 Marks)
- 8 Explain in brief the following :  
 a. Functions of various registers. (10 Marks)  
 b. Register organization of Intel 4004 microprocessor. (10 Marks)

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10ME65

**Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015**  
**Mechatronics & Microprocessor**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART - A**

- 1 a. Define mechatronics. List the advantages and disadvantages of mechatronics. (04 Marks)  
 b. Explain briefly elements of closed loop control system with a example. (08 Marks)  
 c. Explain with the block diagram, how a microprocessor control system is used to control the focusing and exposure in an automatic camera. (08 Marks)
- 2 a. Define the following terms: i) Hysteresis error ii) Accuracy (04 Marks)  
 b. What is hall effect? Explain the principle of hall effect with neat sketch. (08 Marks)  
 c. Explain how sensing is achieved by an incremental optical encoder. Write its applications. (08 Marks)
- 3 a. What is an actuator? Name any four important solid state switches and explain each in brief. (10 Marks)  
 b. Write and explain non-permanent magnet type DC motors with schematic diagrams. (10 Marks)
- 4 a. Define signal conditioning, what are the necessity for signal conditioning. (04 Marks)  
 b. Explain balance mode of wheat stone bridge and hence deduce the expression for change in output voltage. (10 Marks)  
 c. With block diagram, explain data acquisition system. (06 Marks)

**PART - B**

- 5 a. Explain the concept of overflow and underflow with an example. (04 Marks)  
 b. What is logic gate? Explain AND, OR, NOR and NAND gates with symbols and truth tables. (10 Marks)  
 c. Convert the following:  
 i)  $(3FD)_{16} = (\quad)_{10}$   
 ii)  $(3509)_{10} = (\quad)_{16}$   
 iii)  $(475.25)_8 = (\quad)_{10}$   
 iv)  $(1101.1)_2 = (\quad)_{10}$  (06 Marks)
- 6 a. What are micro-controllers? Distinguish between a micro-processor and micro-controllers. (06 Marks)  
 b. Explain with a neat sketch. The internal architecture of Intel 8085 microprocessor. (14 Marks)
- 7 a. Briefly explain the classification of instructions provided by 8085. (10 Marks)  
 b. Write a program for multiply two 8-bit numbers stored in memory locations 2200 H and 2201 H. Store the result in memory locations 2300 H and 2301 H. (10 Marks)
- 8 a. Explain the flow of instruction and data in the 8085 microprocessor. (10 Marks)  
 b. List the four operations performed by CPU. (04 Marks)  
 c. Distinguish between instruction cycle, machine cycle and T-state. (06 Marks)

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**Sixth Semester B.E. Degree Examination, June / July 2014**

**Mechatronics & Microprocessor**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

- 1 a. Discuss a measurement system and its constituent elements. (08 Marks)  
 b. Explain 'programmable logic controller'. (04 Marks)  
 c. Illustrate the basic elements of a microprocessor based engine management system. (08 Marks)
- 2 Illustrate the following proximity sensors:  
 a. Capacitive type. (10 Marks)  
 b. Pneumatic type. (10 Marks)
- 3 a. Discuss the construction and operation of permanent magnet DC motor. (08 Marks)  
 b. Illustrate any two types of DC motor configurations. (08 Marks)  
 c. Illustrate the construction and working of an electrical relay. (04 Marks)
- 4 a. Discuss the inverting and non inverting configurations of OPAMPS. (08 Marks)  
 b. Illustrate how OPAMPS can be realized for an adding operation. (05 Marks)  
 c. Illustrate a DAQ system. (07 Marks)

**PART – B**

- 5 a. Present the Boolean expressions, symbols and truth tables for 3 input NAND gate and 3 input NOR gate. (10 Marks)  
 b. Write the Boolean algebra expressions for the following:  
 i) Commutative law.    ii) Associative law.    iii) Distributive law. (06 Marks)  
 c. For the circuit shown in Fig. Q5 (c), obtain the expression for Y in terms of  $X_0$ ,  $X_1$ , A and B inputs. (04 Marks)

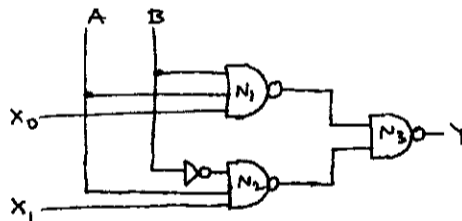


Fig. Q5 (c)

- 6 Discuss the following with respect to internal architecture of a microprocessor:  
 a. A typical memory device. (10 Marks)  
 b. Instruction register. (10 Marks)
- 7 a. Discuss the term 'BUS' with reference to the architecture of a microprocessor. (10 Marks)  
 b. Discuss the different addressing modes used in microprocessors with an example for each. (10 Marks)
- 8 a. Explain fetch, execute and instruction cycles with a diagram. (06 Marks)  
 b. Illustrate the data flow from memory to the data register. (08 Marks)  
 c. Illustrate the terms machine cycle and state, associated with microprocessors. (06 Marks)

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**Sixth Semester B.E. Degree Examination, Dec.2013/Jan.2014**  
**Mechatronics and Microprocessor**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. What are primary objectives of mechatronics? Explain with a block diagram the key components in a typical mechatronics system. (10 Marks)
- b. Explain with a block diagram, the working of automatic camera. (10 Marks)
- 2 a. Distinguish between sensor and transducer. Explain detail the classification of transducers. (10 Marks)
- b. Write short notes on the following: i) Proximity sensors, ii) Hall effect sensors. (10 Marks)
- 3 a. Write brief notes on silicon controlled rectifier and junction field effect transistors. (10 Marks)
- b. Explain with neat circuit diagrams, various types of D.C. rotors with respect to field coils. (10 Marks)
- 4 a. What is data acquisition? Explain with block diagram DAQ system. (08 Marks)
- b. Write short notes on the following:
  - i) Multiplexer. (06 Marks)
  - ii) Explain analog to digital conversion process. (06 Marks)

**PART – B**

- 5 a. What is a microprocessor? Draw the block diagram of a micro computer and explain briefly the three segments (ALU, register and control unit) of a microprocessor. (10 Marks)
- b. Define logic gates. Draw the symbols of AND, OR, EXOR and NOT gates and corresponding truth tables. (10 Marks)
- 6 a. Explain Intel 8085 microprocessor with the help of block diagram. (10 Marks)
- b. Explain briefly a microcontroller, with a simplified block diagram. (06 Marks)
- c. Compare microprocessors and microcontrollers. (04 Marks)
- 7 a. Briefly explain the various forms of memory unit: i) ROM; ii) PFROM; iii) EPROM; iv) EEPROM; v) RAM. (10 Marks)
- b. Write short notes on the following:
  - i) Data and address bus. (10 Marks)
  - ii) Instruction register and temporary register. (10 Marks)
- 8 Write short notes on the following:
  - a. Elements of closed loop control system.
  - b. Bimetallic thermostat.
  - c. Laws of Boolean algebra.
  - d. Classification of micro controllers. (20 Marks)

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## Sixth Semester B.E. Degree Examination, June/July 2013

### Mechatronics and Microprocessor

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

#### PART – A

- 1 a. Define mechatronics. Explain the differences between conventional approach and mechatronic approach to product design. (08 Marks)
- b. What is measurement and control systems? Explain with examples. (08 Marks)
- c. Illustrate a closed loop system with an example. (04 Marks)
- 2 a. Define the following terms:
  - i) Accuracy
  - ii) Resolution
  - iii) Response time
  - iv) Settling time
 (06 Marks)
- b. Explain with a neat sketch, an eddy current proximity sensor. (06 Marks)
- c. Explain how sensing is achieved by an absolute optical encoder. (08 Marks)
- 3 a. Show how bipolar transistor can be used as a switch. (10 Marks)
- b. What are stepper motors? Explain with a neat sketch, the principle of working of a permanent magnet stepper motor. (10 Marks)
- 4 a. Write the pin connections for a 741 operational amplifier. (04 Marks)
- b. Explain the principle of ADC of signals. (08 Marks)
- c. What is pulse modulation? Explain the two types of modulation. (08 Marks)

#### PART – B

- 5 a. What are universal gates? With the help of symbols and truth table, explain NOR and NAND gates. (05 Marks)
- b. Using 8 bits, show how a negative number  $(-91)_{10}$  is stored in memory. (07 Marks)
- c. Convert the following:
  - i)  $(4DFA)_{16} = (\dots\dots\dots)_{10}$
  - ii)  $(0.862)_{10} = (\dots\dots\dots)_2$
  - iii)  $(2747)_8 = (\dots\dots\dots)_{10}$
  - iv)  $(1100100101)_2 = (\dots\dots\dots)_{16}$
 (08 Marks)
- 6 a. Explain with a neat sketch, the internal architecture of INTEL 8085 microprocessor. (12 Marks)
- b. Explain the following terminology, related to microprocessor:
  - i) Program counter
  - ii) Flag register
  - iii) Stack pointer
  - iv) Accumulator
 (08 Marks)
- 7 a. Explain the different types of addressing modes of INTEL 8085 microprocessor, with examples. (10 Marks)
- b. With a flow chart, write a program for multiplication of two 8-bit numbers located in different memory locations and store the result back into memory. (10 Marks)
- 8 a. Explain the flow of instruction and data in the 8085 microprocessor. (10 Marks)
- b. Draw and explain the timing diagram for memory write operation. (10 Marks)

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