

**EK-294**

**B.E. (Vth Sem.) (CGPA) Mech. Engg. Exam.-2016**

**MECHATRONICS**

Paper - M-504

*Time Allowed : Three Hours*

*Maximum Marks : 60*

*Note :* There is internal choice from question number II to VI. Marks allotted are given against each question. Assume missing/misprint data suitably. Answer all parts of a question at one place only.

Q.1 Choose the correct answer—  $1\frac{1}{2} \times 8 = 8$

- (i) Which of the following is/are characteristics of mechatronic products and systems—
- (a) Functional interaction between mechanical, electronic and information technologies
  - (b) Special interaction of subsystems in one physical unit
  - (c) Intelligence related to the control functions of the mechatronics system
  - (d) All of the above

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P.T.O.

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- (ii) In which stage the measurement system comes in contact with the quantity to be measured—
- (a) Transducer stage
  - (b) Signal processing stage
  - (c) Output stage
  - (d) None of the above
- (iii) The capacity of a data acquisition system (DAQ) can be specified in terms of—
- (a) Number of control elements
  - (b) Number of channels
  - (c) Number of interfaces
  - (d) Number of functions
- (iv) PLC can be ..... in plant to change the sequence of operation—
- (a) Only programmed
  - (b) Only reprogrammed
  - (c) Programmed & reprogrammed
  - (d) Able to give a set point
- (v) What is the ratio of amplitude of response to that of the input called—
- (a) Response
  - (b) Gain
  - (c) Phase
  - (d) Frequency

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Contd. ....

(3)

- (vi) A transducer converts—
- (a) Mechanical energy into electrical energy
  - (b) Mechanical displacement into electrical signal
  - (c) One form of energy into another form of energy
  - (d) Electrical energy into mechanical energy

(vii) The gauge factor is defined as—

(a)  $\frac{\Delta L/L}{\Delta R/R}$

(b)  $\frac{\Delta R/R}{\Delta L/L}$

(c)  $\frac{\Delta R/R}{\Delta D/D}$

(d)  $\frac{\Delta R/R}{\Delta \rho/\rho}$

(4)

(viii) Which type of building blocks in inductors—

- (a) Electrical
- (b) Thermal
- (c) Mechanical
- (d) Hydraulic

- Q.II (a) Explain the construction of wire wound strain, gauges and derive the expression for the gauge factor. 5
- (b) Explain the different principles of working of capacitive transducers. 5

or

- (a) Describe the different criteria for selection of transducers for a particular application.
- (b) Describe the construction of foil type strain gauges and explain their advantages over wire wound strain gauges.
- Q.III (a) What are the advantages and disadvantages of a pneumatic actuator system. 5
- (b) Explain a mechanical actuator system with neat sketch. 5

or

(5)

- (a) Explain the components of a hydraulic actuator system with the help of a neat diagram.
- (b) Explain an electrical actuator system. Explain in brief about the devices used in such system.

Q.IV (a) What do you mean by a system model? Explain building block of a system with example. 5

- (b) Explain in brief various electrical system building blocks. 5

or

- (a) How is the model for a hydraulic system built up? Explain.
- (b) Explain the significance and functions of spring-mass-dashpot in a translation building block.

Q.V (a) Describe any one method of analog to digital (A/D) conversion. 5

- (b) Explain the characteristics of an ideal operational amplifier. Explain the functions of its two input signals. 5

or

- (a) Write a brief note on signal conditioning.

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- (b) Derive the expression for input impedance of an operational amplifier.

Q.VI (a) Explain a basic microprocessor with the help of a block diagram. 4

- (b) What do you understand by PLC? Explain the basic structure of PLC. 4

or

- (a) Write a short note on "SCARA Robot as a mechatronic system.

- (b) What is parallel and serial data communication? Explain.