

**M.TECH/AEIE/2ND SEM/AEIE 5232/2015
2015**

**Industrial Automation Technology
(AEIE 5232)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

***Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.***

***Candidates are required to give answer in their own words as far as
practicable.***

Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following: **10 x 1=10**
- (i) Which frequency represents bit 1 in FSK based HART protocol?
(a) 1200 Hz (b) 1200 KHz (c) 2200 Hz (d) 2200 KHz.
- (ii) What should be the preset value of a timer to obtain a delay of 10 seconds if the time base is 0.01 seconds?
(a) 1 (b) 10 (c) 100 (d) 1000.
- (iii) A Industrial Control System can be a
(a) PLC only (b) DCS only (c) both PLC & DCS (d) None of these.
- (iv) As per the ISO-OSI reference model, at what layer is the routing of data packets resolved?
(a) Layer 1 (b) Layer 2 (c) Layer 3 (d) Layer 4.
- (v) In Manchester coded signals, signal transition is
(a) at the start of the bit time (b) at the centre of the bit time
(c) at the end of the bit time (d) any of these.
- (vi) The back plane of a rack mounted PLC system consists of
(a) address bus, data bus & 5 Vdc (b) fieldbus, data bus & 24Vdc
(c) address bus, data bus & 24 Vdc (d) fieldbus, data bus & 5 Vdc.
- (vii) System availability is defined as
(a) MTTR / (MTBF + MTTR) (b) MTTR / MTBF
(c) MTBF / (MTBF + MTTR) (d) MTBF / MTTR.
- (viii) The access method for wireless LANs (IEEE 802.11) is based on
(a) CDMA (b) CSMA/CD
(c) CSMA/CA (d) Token passing.

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(ix) With reference to Plant Safety, SIS stands for

- (a) Safety Integrated Systems (b) Safety Instrumented Systems
(c) Safety Interlocked Systems (d) None of these.

(x) DCS architecture can be

- (a) physically distributed (b) functionally distributed
(c) both physically & functionally distributed (d) None of these.

Group - B

2. Discuss the evolution of automation in industry from conventional to contemporary control systems. Explain briefly how technological advances in communication technology have helped in implementing industrial automation on a wide scale.

(6+6)=12

3. What is Asset Management? Explain the concept of Computer Integrated Processing. What are the equipment required at various levels of plant automation hierarchy to implement CIP?

(2+4+6)=12

Group - C

4. Draw a PLC ladder program for implementation of the process interlock outlined below: Water is being pumped from Ground Reservoir R01 to Overhead Tank T01. R01 is provided with low level switch (LSL 01) to prevent dry run of pump. A low level switch (LSL 02) to indicate empty tank and a high level switch (LSH 02) to indicate full tank are provided for automatic operation of the pump. Only NC contacts are available from the level switches. (Input - Output List must be prepared).

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5. With the help of a suitable timing diagram, explain the retentive characteristics of a retentive off delay timer. What features are available in a software timer? How is a Pulse timer different from an on delay timer? Draw a ladder program to ensure that a conveyor stops 10 seconds after the hopper gate has closed. Assume that a limit switch detects whether hopper gate is closed or open. Indicate the type of contacts (whether NC or NO) of the limit switch have been considered by you.

(4+2+2+4)=12

Group - D

6. Draw a typical Industrial Control System architecture and explain the benefits of a geographically distributed architecture as opposed to a centralised one. How is functional distribution achieved? What kind of architecture do modern day control systems have and why?

(7+3+2)=12

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7.(a) What are the functions of a Local Control Unit of a DCS? Draw a schematic block diagram of an LCU and discuss the parameters that need to be considered for its proper selection.

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Group - E

8. What are the basic functions of an Operator Station? What are the configuration responsibilities that have to be handled by the Engineering Station?

(8+4)=12

9. What is meant by a Safety Instrumented System? What are the basic components of such a system? In this context explain the significance of HAZOP study. Explain SIF with an example.

(3+4+3+2)=12