

**GANPAT UNIVERSITY**  
**B. TECH SEM- VI (ELECTRICAL ENGINEERING)**  
**REGULAR EXAMINATION APRIL-JUNE 2017**  
**2EE606: Industrial Instrumentation & Automation**

Time: 3 Hrs

TOTAL MARKS: 60

- Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.  
 (2) Figures on right indicate marks.  
 (3) Be precise and to the point in answering the descriptive questions.

**SECTION I**

Q.1

- (A) Develop ladder diagram for the system in which there are three motors A, B and C. When start button is pressed, motor A starts at same time but motor B & C start after 4 seconds and 5 seconds respectively. And when stop button is pressed motor C stops immediately but motor A & B stops after 3 seconds. (05)  
 (B) Draw basic block diagram of PLC. And also state the function of each module. (05)

**OR**

Q.1

- (A) Explain ON DELAY Timer of PLC with necessary figure and timing diagram. (04)  
 (B) Construct the ladder diagram of PLC for the system in which there are three machine each machine has its own start & stop pushbutton but only one machine can run at time without intermediate stop. (Do not use Latch/Unlatch coil or contact) (04)  
 (C) Design ladder diagram for X-NOR logical gate. (02)

Q.2

**Attempt following Questions. (10)**

- (1) What are the three characteristics processes make them potential candidates for SCADA?  
 (2) Why is an uninterruptible power supply (UPS) needed at RTU?  
 (3) What does protocol driver do?  
 (4) What is the purpose of flow totalizer?  
 (5) Calculate scan interval of SCADA system in which there are 15 RTU, 896 point counts for each RTU, 1200 communication rate of UHF radio with 40% communication efficiency.

**OR**

Q.2

- (A) Draw the basic layout of SCADA system and discuss the function of RTU and MTU (05)  
 (B) Explain SCADA based monitoring and controlling of a gas lift system. (05)

Q.3

**Attempt following questions. (10)**

- (A) Explain the following instruction of PLC.  
 (i) LIM instruction  
 (ii) LEQ instruction  
 (B) Write a short note on "Ultrasonic Sensor".

## SECTION II

Q.4

- (A) Discuss strain gauge and derive expression of gauge factor  $G_f$  for strain gauge. (05)  
(B) A thermistor has a resistance of  $390 \Omega$  at  $0^\circ\text{C}$  and  $3895 \Omega$  at  $62^\circ\text{C}$ . The resistance temperature relationship is given by  $R_T = a R_0 \times e^{b/T}$  with the usual notations. Calculate value of the constants  $a$  and  $b$ . Also calculate the range of resistance to be measured in case the temperature varies from  $40^\circ\text{C}$  to  $90^\circ\text{C}$ . (05)

OR

Q.4

- (A) Discuss piezoelectric transducer also derive output equation for Piezoelectric transducer. (05)  
(B) A compressive force is applied to a component having strain of 50 micro-strains. Two separate strain gauges are attached to this component, one is made of nickel wire strain gauge having a gauge factor of -15 and other strain gauge is having a gauge factor of 3. Calculate the value of the resistance of both strain gauges after they are strained. The resistances of both the gauges before being strained were  $150\Omega$ . (05)

Q.5

- (A) Discuss stroboscopic method for angular speed measurement. (05)  
(B) A LVDT is used in accelerometer to measure mass displacement. The LVDT and signal conditioning output are  $0.31\text{mV/mm}$  with a  $\pm 20$  mm core displacement. The spring constant is  $240 \text{ N/m}$  and the core mass is  $0.05 \text{ kg}$ . Find (a) relation between acceleration in  $\text{m/s}^2$  and the output voltage, (b) natural frequency, and (c) maximum acceleration. (05)

OR

Q.5

- (A) Derive flow rate equation for orifice meter with appropriate assumption and discuss its problem and features. (05)  
(B) Short note on Moving coil type linear velocity measurement (05)

Q.6

- Attempt any two** (10)  
(A) What is encoder and explain type of encoder with necessary diagrams  
(B) Explain characteristics of transducer . What are the requirements considered in selection of transducer?  
(C) What is smart sensor? Draw & explain its basic block diagram.

END OF PAPER