

IQRA National University, Peshawar Department of Electrical Engineering Spring 2020 Elective 5 (Power). Elective 4 (Electronics). Industrial Electronics Terminal Examination

Reg.No: 13223 Instructor: Engr. Sanaullah Ahmad

<u>Total Marks : 50</u> <u>Attempt All Questions.</u>

Question No 1.

A. Consider a lubricating oil tank in Industrial Plant having 2 sensors, one is put near to the bottom and one near to top, to fill the tank, motor A will pump oil to tank until the high level sensor turns on, at that point the motor A turns OFF. Motor A is turned ON when the level fall below the low level sensor. Explain the states of PLC operating cycle with help of neat ladder diagrams. CLO-3

Question No 2

- A. Write some benefits of Industrial Automation CLO-2
- B. Briefly explain the components and functions of SCADA system CLO-2

Question No 3

- A. Differentiate between Hardwired control systems and PLC system CLO-3
- B. What are the function of SCADA systems CLO-2

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I Q#1(A) olution -Address Input 0000 lours level Sensor 00 01 High Sensor level Adress Output 0500 Motor Internal utility Relay 1000 " The diagram ladder 0001 1000 0000 ++ ++ 1000 ++ 0500 44 END

2 Scan (1) Initially the tank is empty The True True 15 time There fore, in. 11pud 0000 ++ ++-0 0001 is 01/50 true. False ++ True True 1 END Scan(2) True True True The Internal is relay ++ is turned ++ -0 the water lavel rise. on as True ++ True True END Falle True True Scan (3) 11-5 ++ After Scan 2 the al level othes above the low level True Senser and it become open i.e. False. True True END

3 "Scan 4 5 false false false After Scan 4 the oil level ++ +++ 0 sises above the high Level Sensors at it also become rises 11i.e false). False Follse 44 0 END Scanls False false false Since there is no more # true logic path output 500 js ho langer (true) Ze energized kalse. the moth tum there fore () OFF. -44-Fatse False 44 0 TEND Sean (6) The level Se False Palse false Alter San'6' hall ++ 0 below Senser The high level and it mill become true Palle again 44 EAR

4 O-AHMAD NAME OKASH 10 13223 Q#2(A) Automation: -Benefits Industrial productivity:. Increasing 0 productivity = more units Ha increase money. more a products produced Consistently more Consistency = higher quality = increased Increase Satistaction Consumer Example: ONINK Such as bottled SOKI А always tastes the. Pepsi Ooke a you Where (a When matter Same no Consumers Count 9t . on Durchase reliably. Moducts produced more Ð 24 hours/day with-Can run robots tired or bored. getting out Decreased Cabor enpenses. 6 Automatic 84stim reduces Deople needed amount and the the produed goods 10

5 in working anditen. Det e by · Increasing The increases System Autonatee in because Rantetion Waking Safely should not reople Ato im light heavy with The Contact alway muchinen lot: reduce · Automation robots Em ploying K Workers. amploying human than Opeaper factory solat Cart Initial Atter the naintanance losts anly or energ He m bag result repairs - This and annual When Compared to Jaino hogher neorkers human ad Saldones (hvest ments. relam manufactuming betler e Automálio makas makes only Industrial accamation not Drofitable and more more manufacturing enlive optimizes also the 94 esticient, human trees Te kind the cess . Machinen technologics mocers, Improve Mine aug 1+ Wark Thed The m locus bo accomated . This Icads Te innovalive hew Customization moducts, increased ad a better Consumer onpinence.

6 Q#2(B SCADA: Camponents l Human Machine interface :-H J/0 Ch 15 device human that allows Operator a Can Trol the This to mocess data. lis achieved loy SCADA'S data base linking Software mouching and Mityrams for information Setailed management U Ke sheduled maintanance, data Schematics and logistic information. The alignostic personnel See () ann all The representation of data. graphical

System: . · SuperVisory System and as a This Serve between the HMI Communication room workstaling Control lottware in LIKE, PLC, RTUS ISUNSONS its equipement and Supervisory Control Smaller have only the single Acquistion Serve as a and data Superviourse or master Pe that system, larger superisony control and data Acquisition System have multiple Server, siter for diastus (recovery recovery and distributed foftware application. e Remôle Terminal bus: System Contain The (Inster faced physical objects that are with semile Terminal units. These deethoric devices are controlled by microprocessor and are used for transmitting occorded data for the Supervicuscy System. They also recieve data from the moster Systen in order te connect Control The Connected objects. · programmable logic Controllers: find PLC'S Their Use in Supervising Central and Vale System Through Sensers - They acquisition I te the Sensers in Iden oure attached Te convert the Sensor output Signal in to digital deta.

Than are meterred over RTV, because Their Configuration, flexibility, apportability 94 hind Versa Hility C · Communication Intrastructures Generally Cambination dired wired Carneten and Gradeo used control and Data in supervioursly Acquisition System. However, SOH/SONFI Can also be for larger systems lite used railways and power state · SCADA mogrammingr SLADA programming in HARE or matter Station is used La Creating dragrams and maps that provide failure. Most of the Commencial Supervices vitual I information during Control and DOTA Acquistion System used Standnzed interfaces Um manning

9 SLADA System: -Functions 9 Acquisition :. DATA a System First you need are much more compton than te monitor one machine with one comput output. Fust a real life SCAPA System needs to monitor hundred or thousands of Sensors. Sensors measure input in the The example, water flowing in te dstem Some Saysons measure reserviour) and output like value messure as water IS reservoir). Some released from the measures Simple events Sensors these be detected by Strigght forward Can Switch Called Va discrete onlott Unpre didital output). Forekample in our simple model The widget pabricator, the Switch light would be discrete on the turn input. In real life disercle input one used to measure Simple States, like Whether equépement is on a off a tripuire d'armi. Liko a pour foilure d'at a critical facility. Some Sensor measure more Implen Situation where onit mensmement 15 important. Data Communication -model & The In our Simple fabricator the "network" is just widge from the Savitch to the Wire leading Danal

light. In real life you want to b able -le monitor multiple System tran location, Central So you need Le Communication network tol transport all the data Collected tran clour Sensers. The Remote telemetry unit (RTU) is neede to provide an Deterpace between the Senser and SCAPA network. The RTU encou The RTU encodes Senser Inpud into protocol formad and grward them to the SCADA master in turn the RTU recieve control commands in protocal parmat from the master and transmit delectrical Signal de the appriate nelays. Data presentation:-These display dement only in our model SCADA System Is the Light That Comes When () the Switch is afirated. The obviously won't do on a you ban't track a lightboood large Seale of () the Thousand Separate light, and you blan't want te pay Bomeone Simply te watch a light badard. The moster presents a Comptentive view of the entire managed System and present more detail in Sepanse to user request. The master also nerform date. processing on information alathered from Sensors. - 91 Unainter report logs and Summarizes historical tempts.

antrol? System SCADA Our had miniature Labricator does't monitoring the Widget elements, lets Say include Carbo any has human also on operator The pannel. When an botton his Control the botton of activates a Presses be fabricator That Switch The widged m te narts widget in tonings more fatricator. For enample: pressure is building much 100 4 SCADA System pipeline the gas a In UD selease value automati cally a Cen adjusted to be producte in Can Electricity the power demands on meet the and.

12 Q # 3(A)Hardwired control System System PLC • The Acenctions are determine e the Lunction are déterminé bay a program lou physical wining Stored in & memory-· Changing the function a The Castrol function means (Changes Can be changed the Simply by wire changing the proppin 6 Can be contact - making Carbol · Consist type (relays, cantadans) dence to which dectronic type logic circuit all the Sensors & are connected. actuators

@ 13 (2#(3)B Functions 9 SLADA System; -DATA Acquisition :. First . a System you need are much more compler than te monitor one machine with one apped output. Tust a real life SCAPA System needs to ingitar hundred a thousands of sensors. Sensors measure input in the The for example, water flowing in te dstem reserviour) and Some Sansers measure output like value messure as water is released from the reservoir). Some measures Simple events that those Sensors Can be detected by Strigght forward on off Switch Called a discrete Unput for didital output). For example in our simple model The widget pabricator, the Switch turn on the light would be discrete input. In real life discribe input one used to measure Simple States, like Whether equipement is on a off a tripuine alarmi. Liko a power feilure Dat a critical facility. Some Sensor measure more Situation where enit measurement important. Data Communication -In our Simple model & The tabricator the "network" is just widget from the Switch to the Danal leading wire

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7-15 · SuperVisory Systemi. (This System and as a Communication Serve between the HMI lottware in control room workstaling and its equipement like PLC, RTU's Sensors Smaller Supervisory Control and data Acquistion have only the single Pc that Serve as a Supervisours of master system. larger superisory control and data Acquisition System have multiple server, siter for diastus (record record and distribute foftware application. · Remole Terminal bus: The System Contain physical objects that are finite faced actives are controlled by microprocessor and are used for transmitting scended data for The Supervicusory System. They also recieve data from the moster System in order to connect Control the Connected objects. · programmable logic Controllers: PLC's find Their Use in Supervioury Central and date acquisition System Through Sensers - They are attached to the Sensers in Iday The Convert the Sensor output Signal

8 16 They are meterred over RTVs because 04 Their Configuration, Adexibility, affordab hand Versa Hity · Communication Intrastructure ? Generally Cambinal 2 For dired wired Cannecter and (bradeo used Supervioursty Control and Data m Acquisition System HOWENER, SDH/SONFT Can also be illed larga Systems file vailways and Station ower · SCADA mogrammingr SLADA mogogmmin Ln HAT or maxing Stadior is Creating dragrams maps that and provole vitual / information decring process avent K failure. Most of the Canmendal Superviory Control and DOTA Acquistion System used Standnzed interfaces In programming