

I'm not robot!

which helps Instrument Engineers to prepare for Field Instrumentation Interview Questions and Answers in Oil and Gas Plant.

Field Instrumentation Questions

1. What are different types of orifice plates? State their uses. Different orifice plates are: 1. Concentric 2. Segmental 3. Eccentric

Concentric: These plates are used for ideal liquid as well as gases and steam service. Concentric holes are present in these plates, that's why it is known as concentric orifice.

Segmental: This plate has hole in the form of segment of the circle. This plate is used for colloidal and sherry flow measurement.

Eccentric: This plate has the eccentric holes. This plate is used in viscous and sherry flow measurement.

2. How do you identify an orifice in the pipeline? An orifice tab is welded on the orifice plate which extends out of the line giving an indication of the orifice plate.

3. Why is the orifice tab provided? Following reasons justify for providing orifice tab: 1. Indication of orifice plate in a line 2. The orifice diameter is marked on it. 3. The material of the orifice plate. 4. The tag number of the orifice plate. 5. To mark the inlet of an orifice. 4. Explain Bernoulli's theorem. State its application. Bernoulli's theorem states that the 'total energy of a liquid flowing from one point to another remains constant'. It is applicable for non-compressible liquids. For different types of liquid flow, Bernoulli's equation changes. There is direct proportion between speed of fluid and its dynamic pressure and its kinetic energy. It can be used in various real life situations like measuring pressure on aircraft wing and calibrating the airspeed indicator. It can also be used to low pressure in the venturi tubes present in carburetor. 5. How can a D.P. transmitter be calibrated? D.P. transmitter can be calibrated using following steps: 1. Adjust zero of Transmitter. 2. Perform static pressure test: Give equal pressure on both sides of transmitter. Zero should not shift either side. If the zero shifts then carry out static alignment. 3. Perform vacuum test: Apply equal vacuum to both the sides. Zero should not shift. 4. Calibration procedure: Give 20 psi air supply to the transmitter and vent L.P. side to atmosphere. Connect output of the instrument to the standard test gauge. Adjust zero. Apply required pressure to the high pressure side and adjust the span. Adjust zero gain if necessary. 6. How is flow measured in square root? Flow varies directly as the square root of pressure. Thus, $F \propto \sqrt{P}$ of square root of applied pressure. Since this flow varies as the square root of differential pressure. The pressure pen does not directly indicate flow. Thus flow can be determined by taking the square root of the pen. Assume the pen reads 50% of the chart. So, flow can be calculated using the pen measure in the chart. 7. Name different parts of a pressure gauge. Explain the use of hair spring in the pressure gauge. Pressure gauge includes following components: a. 'C' type bourdon tube. b. Connecting link. Sector gear. Pinion gear. Hair spring. Pointing. Dial Use of hair spring: Hair spring is responsible for controlling torque. It is also used to eliminate any play into linkages. 8. How D.P. transmitter can be applied to close tank? In closed tank, bottom of the tank is connected to the high pressure side of the transmitter. Top of tank is connected to the lower pressure side of the transmitter. In this way vessel pressure can be measured. 9. How D.P. transmitter can be applied to open tank? In open tank the lower pressure side is vented to the atmosphere. All pressure is applied to the high pressure side. This vessel pressure is measured through high pressure side. 10. Explain the working of an electronic level trol? The variation in level of buoyancy resulting from a change in liquid level varies the net weight of the displacer increasing or decreasing the load on the torque arm. This change is directly proportional to change in level and specific gravity of the liquid. The resulting torque tube movement varies the angular motion of the rotor in RVDT providing a rotor change proportional to the rotor displacement, which is converted and amplified to a D.C. current. 11. Explain the working of an enraf level gauge. Enraf level gauge is based on the servo powered null balance technique. A displacer serves as continuous level sensing element. A two phase servo motor controlled by a capacitive balance system winds unwinds the measuring wire until the tension in the weight springs is in balance with the weight of the displaced part immersed in the liquid. The sensing system in balance measures the two capacitance formed by the moving central sensing rod provided by the two capacitor plates and the si plates. 12. What is the constant voltage unit? The constant voltage circuit consists of a rectifier, CR and a filter capacitor. It is followed by two stages of zener regulation. A bridge configuration is provided to lamp line voltage zener regulation. 13. Explain the burnout feature. Burnout provides the warnsg feature of driving indicator at the end of scale, if the input circuit is open. A burnout resistor is provided which develops a voltage drop between the measuring circuit and amplifier. The polarity of the signal determines the direction of the servo drive upon an open circuit in the input. Upscale burnout: R value 10 MDownscale burnout: R value 22 M14. Why thermowells are used? What materials are used in thermowells? In numerous applications, it is neither desirable nor practical to expose a temperature sensor directly to a material. Wells are therefore used to protect against damage corrosion, abrasion and high pressure processes. A thermowell is also useful in protecting a sensor from physical damage during handling and normal operations. Materials used in thermowells: Stainless steel, Inconel, Monel, Alloy Steel, Hastelloy. 15. How is automatic reference junction compensation carried out in temperature recorders? In automatic reference junction compensation, variable nickel resistor is used. As the temperature changes, so does its resistance. This reference junction compensator is located, so that it will be at the temperature of the reference junction. The reference junction is at the post where the dissimilar wire of the thermocouple is rejoined. This joint is invariably at the terminal strip of the instrument. 16. What are de-saturators? When, in some processes, e.g. batch processes, long transient responses are expected during which a sustained deviation is present the controller integral action continuously drives the output to a minimum or maximum value. This phenomenon is called 'integral saturation of the control unit'. When this condition is met, then this unit is de-saturated. 17. Explain the working of Rotameter. Variable area meters are special form of head meters. Where in the area of flow restrictor is varied. So as to hold the differential pressure constant. The rota meter consists of a vertical tapered tube through which the metered fluid flows in upward direction. As the flow varies the 'float' rises or falls to vary the area of the passages that the differential across it balances the gravitational force on the 'float'. The differential pressure is maintained constant. The position of the 'float' is the measure of the rate of flow. 18. What is the working principle of the magnetic meter? An electric potential is developed when a conductor is moved across the magnetic field. In most electrical machinery the conductor is a wire. The principle is equally applicable to a moving, electrically conductive liquid. The primary device of commercial magnetic meters consist of straight cylindrical electrically insulated tube with a pair of electrodes nearly flush with the tube walls and located at opposite end of a tube diameter. This device is limited to electrically conducting liquids. The magnetic meter is particularly suited to measurement of slurries and dirty fluids. 19. Explain the mechanism behind the turbine meter. Turbine meters consist of straight flow tube within which a turbine or fan is free to rotate about its axis which is fixed along the centre line of the tube. Mostly, a magnetic pick up system senses the rotation of the rotor through the tube walls. The turbine meter is a flow rate device, since the rotor speed is directly proportional to the flow rate. The output is usually in the form of electric pulses from the magnetic pick up with a frequency proportional to the flow rate. 20. How would you choose differential range? The most common range for differential range for liquid measurement is 0-100. This range is high enough to minimize the errors caused by unequal heads in the seal chambers. It is also dependent on the differences in the temperature of the load lines. The 100 range permits an increased in capacity up to 400. While decrease down up to 20 by merely changing the range tubes or range adjustments. 21. What is the use of single seated valve? The single seated valve is used on smaller sizes where an absolute shut off is required. The use of single seated valve is limited by pressure drop across the valve in the closed or almost closed position. 22. What is the use of double seated valve? In double seated valves the upward and downward forces on the plug due to reduction of fluid pressure are nearly equalized. It is generally used on bigger size valves and high pressure systems. Actuator forces required are less. 23. What is the use of valve positioner? Valve positioner can be used for following reasons: a. Quick action. b. Valve hysteresis. c. Viscous liquids. d. Split range. e. Line pressure changes on valve. f. Bench set not standard. g. Reverse valve operations. 24. What are primary elements of measuring pressure? Which type of pressure can be measured by these elements? Primary elements of measuring pressure are: a. Bourdon Tube. b. Diaphragm. c. Capsuled. d. Bellows. e. Pressure springs. These elements are known as elastic deformation pressure elements. 25. Name different types of bourdon tubes. Types of bourdon tubes: 1. C type. 2. Spiral. 3. Helix. 26. What are different types of control valves? The commonly used control valves can be defined as follows: a. Depending on Action: Depending on action there are two types of control valves. 1. Air to close. 2. Air to open. Depending on body: Depending on body there are 4 types of control valves. 1. Globe valves. 2. Angle valves. 3. Butterfly valves. 4. Three way valves. 27. What is furnace draft control? Balanced draft boilers are generally used negative furnace pressure. When both forced draft and induced draft are used together, at some point in the system the pressure will be same as that of atmosphere. Therefore the furnace pressure must be negative to prevent hot gas leakage. Excessive vacuum in the furnace however produces heat losses through air infiltration. The most desirable condition is that the one have a very slight negative pressure of the top of furnace. 28. What is intrinsically safe system? Intrinsic safety is a technique for designing electrical equipment for safe use in locations made hazardous by the presence of flammable gas or vapours in the air. Intrinsically safe circuit is one in which any spark or thermal effect produce either normally or under specified fault conditions is incapable of causing ignition of a specified gas or vapour in air mixture at the most ignited concentration. 29. What is zener diode? What is voltage regulator? The breakdown region of a p-n diode can be made very sharp and almost vertical diodes with almost vertical breakdown region are known as zener diodes. A zener diode operating in the breakdown region is equivalent to a battery. Because of this current through zener diode can change but the voltage remains constant. It is this constant voltage that has made the zener diode an important device in voltage regulation. Voltage regulator: The output remains constant despite changes in the input voltage due to zener effect. 30. What is force balance principle? State some of its advantages. Force balance principle: A controller which generates an output signal by opposing torque. The input force is applied on the input bellows which moves the beam. This crackles nozzle back pressure. The nozzle back pressure is sensed by the balancing bellows which brings the beam to balance. The baffle movement is very less about 0.002 for full scale output. Advantages: a. Moving parts are fewer. b. Baffle movement is negligible. c. Frictional losses are less. 31. What is motion balance principle? A controller which generates an output signal by motion of its parts. The increase in the baffle is to move towards the nozzle. The nozzle back pressure will increase. This increase in the back pressure acting on the balancing bellows, will expand the bellows. The nozzle is moved upward due to this. The nozzle will move until motion almost equals the input baffle motion. 32. How will you test a transistor with a multimeter? 1. Emitter +ve of meter and base -ve output = Low resistance. 2. Emitter -ve of meter and base +ve output = High resistance. 3. Collector +ve and base -ve output = Low. 4. Collector -ve and base +ve output = Low. Emitter: Collector = High resistance. PNP: Opposite Results. 33. Explain ratio control system. A ratio control system is characterized by the fact that variations in the secondary variable don't reflect back on the primary variable. A ratio control system is the system where secondary flow is held in some proportion to a primary uncontrollable flow. If we assume that the output of a primary transmitter is A, and the output of the secondary transmitter is B, and that the multiplication factor of the ratio relay is K, then for equilibrium conditions which means set valve is equal to measured valve, we find the following relation: $KA - B = 0$ or $B/A = K$ where 'K' is the ratio setting of the relay. 34. What is solenoid valve? Where it is used? A solenoid is electrically operated valve. It consists of solenoid coil in which magnetic plunger moves. This plunger is connected to the plug and tends to open or close the valve. There are two types of solenoid valves: 1. Normally Open. 2. Normally closed. Use: It is used for safety purpose in different electric work. Articles You May Like : Basics of Level Measurement Instrumentation Technical Interview Instrument Technician Questions Fundamentals of Valves and Types PLC Raw Count Calculation

which helps Instrument Engineers to prepare for Field Instrumentation Interview Questions and Answers in Oil and Gas Plant.

Field Instrumentation Questions

1. What are different types of orifice plates? State their uses. Different orifice plates are: 1. Concentric 2. Segmental 3. Eccentric

Concentric: These plates are used for ideal liquid as well as gases and steam service. Concentric holes are present in these plates, that's why it is known as concentric orifice.

Segmental: This plate has hole in the form of segment of the circle. This plate is used for colloidal and sherry flow measurement.

Eccentric: This plate has the eccentric holes. This plate is used in viscous and sherry flow measurement.

2. How do you identify an orifice in the pipeline? An orifice tab is welded on the orifice plate which extends out of the line giving an indication of the orifice plate.

3. Why is the orifice tab provided? Following reasons justify for providing orifice tab: 1. Indication of orifice plate in a line 2. The orifice diameter is marked on it. 3. The material of the orifice plate. 4. The tag number of the orifice plate. 5. To mark the inlet of an orifice. 4. Explain Bernoulli's theorem. State its application. Bernoulli's theorem states that the 'total energy of a liquid flowing from one point to another remains constant'. It is applicable for non-compressible liquids. For different types of liquid flow, Bernoulli's equation changes. There is direct proportion between speed of fluid and its dynamic pressure and its kinetic energy. It can be used in various real life situations like measuring pressure on aircraft wing and calibrating the airspeed indicator. It can also be used to low pressure in the venturi tubes present in carburetor. 5. How can a D.P. transmitter be calibrated? D.P. transmitter can be calibrated using following steps: 1. Adjust zero of Transmitter. 2. Perform static pressure test: Give equal pressure on both sides of transmitter. Zero should not shift either side. If the zero shifts then carry out static alignment. 3. Perform vacuum test: Apply equal vacuum to both the sides. Zero should not shift. 4. Calibration procedure: Give 20 psi air supply to the transmitter and vent L.P. side to atmosphere. Connect output of the instrument to the standard test gauge. Adjust zero. Apply required pressure to the high pressure side and adjust the span. Adjust zero gain if necessary. 6. How is flow measured in square root? Flow varies directly as the square root of pressure. Thus, $F \propto \sqrt{P}$ of square root of applied pressure. Since this flow varies as the square root of differential pressure. The pressure pen does not directly indicate flow. Thus flow can be determined by taking the square root of the pen. Assume the pen reads 50% of the chart. So, flow can be calculated using the pen measure in the chart. 7. Name different parts of a pressure gauge. Explain the use of hair spring in the pressure gauge. Pressure gauge includes following components: a. 'C' type bourdon tube. b. Connecting link. Sector gear. Pinion gear. Hair spring. Pointing. Dial Use of hair spring: Hair spring is responsible for controlling torque. It is also used to eliminate any play into linkages. 8. How D.P. transmitter can be applied to close tank? In closed tank, bottom of the tank is connected to the high pressure side of the transmitter. Top of tank is connected to the lower pressure side of the transmitter. In this way vessel pressure can be measured. 9. How D.P. transmitter can be applied to open tank? In open tank the lower pressure side is vented to the atmosphere. All pressure is applied to the high pressure side. This vessel pressure is measured through high pressure side. 10. Explain the working of an electronic level trol? The variation in level of buoyancy resulting from a change in liquid level varies the net weight of the displacer increasing or decreasing the load on the torque arm. This change is directly proportional to change in level and specific gravity of the liquid. The resulting torque tube movement varies the angular motion of the rotor in RVDT providing a rotor change proportional to the rotor displacement, which is converted and amplified to a D.C. current. 11. Explain the working of an enraf level gauge. Enraf level gauge is based on the servo powered null balance technique. A displacer serves as continuous level sensing element. A two phase servo motor controlled by a capacitive balance system winds unwinds the measuring wire until the tension in the weight springs is in balance with the weight of the displaced part immersed in the liquid. The sensing system in balance measures the two capacitance formed by the moving central sensing rod provided by the two capacitor plates and the si plates. 12. What is the constant voltage unit? The constant voltage circuit consists of a rectifier, CR and a filter capacitor. It is followed by two stages of zener regulation. A bridge configuration is provided to lamp line voltage zener regulation. 13. Explain the burnout feature. Burnout provides the warnsg feature of driving indicator at the end of scale, if the input circuit is open. A burnout resistor is provided which develops a voltage drop between the measuring circuit and amplifier. The polarity of the signal determines the direction of the servo drive upon an open circuit in the input. Upscale burnout: R value 10 MDownscale burnout: R value 22 M14. Why thermowells are used? What materials are used in thermowells? In numerous applications, it is neither desirable nor practical to expose a temperature sensor directly to a material. Wells are therefore used to protect against damage corrosion, arosion, abrasion and high pressure processes. A thermowell is also useful in protecting a sensor from physical damage during handling and normal operations. Materials used in thermowells: Stainless steel, Inconel, Monel, Alloy Steel, Hastelloy. 15. How is automatic reference junction compensation carried out in temperature recorders? In automatic reference junction compensation, variable nickel resistor is used. As the temperature changes, so does its resistance. This reference junction compensator is located, so that it will be at the temperature of the reference junction. The reference junction is at the post where the dissimilar wire of the thermocouple is rejoined. This joint is invariably at the terminal strip of the instrument. 16. What are de-saturators? When, in some processes, e.g. batch processes, long transient responses are expected during which a sustained deviation is present the controller integral action continuously drives the output to a minimum or maximum value. This phenomenon is called 'integral saturation of the control unit'. When this condition is met, then this unit is de-saturated. 17. Explain the working of Rotameter. Variable area meters are special form of head meters. Where in the area of flow restrictor is varied. So as to hold the differential pressure constant. The rota meter consists of a vertical tapered tube through which the metered fluid flows in upward direction. As the flow varies the 'float' rises or falls to vary the area of the passages that the differential across it balances the gravitational force on the 'float'. The differential pressure is maintained constant. The position of the 'float' is the measure of the rate of flow. 18. What is the working principle of the magnetic meter? An electric potential is developed when a conductor is moved across the magnetic field. In most electrical machinery the conductor is a wire. The principle is equally applicable to a moving, electrically conductive liquid. The primary device of commercial magnetic meters meters consist of straight cylindrical electrically insulated tube with a pair of electrodes nearly flush with the tube walls and located at opposite end of a tube diameter. This device is limited to electrically conducting liquids. The magnetic meter is particularly suited to measurement of slurries and dirty fluids. 19. Explain the mechanism behind the turbine meter. Turbine meters consist of straight flow tube within which a turbine or fan is free to rotate about its axis which is fixed along the centre line of the tube. Mostly, a magnetic pick up system senses the rotation of the rotor through the tube walls. The turbine meter is a flow rate device, since the rotor speed is directly proportional to the flow rate. The output is usually in the form of electric pulses from the magnetic pick up with a frequency proportional to the flow rate. 20. How would you choose differential range? The most common range for differential range for liquid measurement is 0-100. This range is high enough to minimize the errors caused by unequal heads in the seal chambers. It is also dependent on the differences in the temperature of the load lines. The 100 range permits an increased in capacity up to 400. While decrease down up to 20 by merely changing the range tubes or range adjustments. 21. What is the use of single seated valve? The single seated valve is used on smaller sizes where an absolute shut off is required. The use of single seated valve is limited by pressure drop across the valve in the closed or almost closed position. 22. What is the use of double seated valve? In double seated valves the upward and downward forces on the plug due to reduction of fluid pressure are nearly equalized. It is generally used on bigger size valves and high pressure systems. Actuator forces required are less. 23. What is the use of valve positioner? Valve positioner can be used for following reasons: a. Quick action. b. Valve hysteresis. c. Viscous liquids. d. Split range. e. Line pressure changes on valve. f. Bench set not standard. g. Reverse valve operations. 24. What are primary elements of measuring pressure? Which type of pressure can be measured by these elements? Primary elements of measuring pressure are: a. Bourdon Tube. b. Diaphragm. c. Capsuled. d. Bellows. e. Pressure springs. These elements are known as elastic deformation pressure elements. 25. Name different types of bourdon tubes. Types of bourdon tubes: 1. C type. 2. Spiral. 3. Helix. 26. What are different types of control valves? The commonly used control valves can be defined as follows: a. Depending on Action: Depending on action there are two types of control valves. 1. Air to close. 2. Air to open. Depending on body: Depending on body there are 4 types of control valves. 1. Globe valves. 2. Angle valves. 3. Butterfly valves. 4. Three way valves. 27. What is furnace draft control? Balanced draft boilers are generally used negative furnace pressure. When both forced draft and induced draft are used together, at some point in the system the pressure will be same as that of atmosphere. Therefore the furnace pressure must be negative to prevent hot gas leakage. Excessive vacuum in the furnace however produces heat losses through air infiltration. The most desirable condition is that the one have a very slight negative pressure of the top of furnace. 28. What is intrinsically safe system? Intrinsic safety is a technique for designing electrical equipment for safe use in locations made hazardous by the presence of flammable gas or vapours in the air. Intrinsically safe circuit is one in which any spark or thermal effect produce either normally or under specified fault conditions is incapable of causing ignition of a specified gas or vapour in air mixture at the most ignited concentration. 29. What is zener diode? What is voltage regulator? The breakdown region of a p-n diode can be made very sharp and almost vertical diodes with almost vertical breakdown region are known as zener diodes. A zener diode operating in the breakdown region is equivalent to a battery. Because of this current through zener diode can change but the voltage remains constant. It is this constant voltage that has made the zener diode an important device in voltage regulation. Voltage regulator: The output remains constant despite changes in the input voltage due to zener effect. 30. What is force balance principle? State some of its advantages. Force balance principle: A controller which generates an output signal by opposing torque. The input force is applied on the input bellows which moves the beam. This crackles nozzle back pressure. The nozzle back pressure is sensed by the balancing bellows which brings the beam to balance. The baffle movement is very less about 0.002 for full scale output. Advantages: a. Moving parts are fewer. b. Baffle movement is negligible. c. Frictional losses are less. 31. What is motion balance principle? A controller which generates an output signal by motion of its parts. The increase in the baffle is to move towards the nozzle. The nozzle back pressure will increase. This increase in the back pressure acting on the balancing bellows, will expand the bellows. The nozzle is moved upward due to this. The nozzle will move until motion almost equals the input baffle motion. 32. How will you test a transistor with a multimeter? 1. Emitter +ve of meter and base -ve output = Low resistance. 2. Emitter -ve of meter and base +ve output = High resistance. 3. Collector +ve and base -ve output = Low. 4. Collector -ve and base +ve output = Low. Emitter: Collector = High resistance. PNP: Opposite Results. 33. Explain ratio control system. A ratio control system is characterized by the fact that variations in the secondary variable don't reflect back on the primary variable. A ratio control system is the system where secondary flow is held in some proportion to a primary uncontrollable flow. If we assume that the output of a primary transmitter is A, and the output of the secondary transmitter is B, and that the multiplication factor of the ratio relay is K, then for equilibrium conditions which means set valve is equal to measured valve, we find the following relation: $KA - B = 0$ or $B/A = K$ where 'K' is the ratio setting of the relay. 34. What is solenoid valve? Where it is used? A solenoid is electrically operated valve. It consists of solenoid coil in which magnetic plunger moves. This plunger is connected to the plug and tends to open or close the valve. There are two types of solenoid valves: 1. Normally Open. 2. Normally closed. Use: It is used for safety purpose in different electric work. Articles You May Like : Basics of Level Measurement Instrumentation Technical Interview Instrument Technician Questions Fundamentals of Valves and Types PLC Raw Count Calculation

Instrumentation Question bank

which helps Instrument Engineers to prepare for Field Instrumentation Interview Questions and Answers in Oil and Gas Plant.

Field Instrumentation Questions

1. What are different types of orifice plates? State their uses. Different orifice plates are: 1. Concentric 2. Segmental 3. Eccentric

Concentric: These plates are used for ideal liquid as well as gases and steam service. Concentric holes are present in these plates, that's why it is known as concentric orifice.

Segmental: This plate has hole in the form of segment of the circle. This plate is used for colloidal and sherry flow measurement.

Eccentric: This plate has the eccentric holes. This plate is used in viscous and sherry flow measurement.

2. How do you identify an orifice in the pipeline? An orifice tab is welded on the orifice plate which extends out of the line giving an indication of the orifice plate.

3. Why is the orifice tab provided? Following reasons justify for providing orifice tab: 1. Indication of orifice plate in a line 2. The orifice diameter is marked on it. 3. The material of the orifice plate. 4. The tag number of the orifice plate. 5. To mark the inlet of an orifice. 4. Explain Bernoulli's theorem. State its application. Bernoulli's theorem states that the 'total energy of a liquid flowing from one point to another remains constant'. It is applicable for non-compressible liquids. For different types of liquid flow, Bernoulli's equation changes. There is direct proportion between speed of fluid and its dynamic pressure and its kinetic energy. It can be used in various real life situations like measuring pressure on aircraft wing and calibrating the airspeed indicator. It can also be used to low pressure in the venturi tubes present in carburetor. 5. How can a D.P. transmitter be calibrated? D.P. transmitter can be calibrated using following steps: 1. Adjust zero of Transmitter. 2. Perform static pressure test: Give equal pressure on both sides of transmitter. Zero should not shift either side. If the zero shifts then carry out static alignment. 3. Perform vacuum test: Apply equal vacuum to both the sides. Zero should not shift. 4. Calibration procedure: Give 20 psi air supply to the transmitter and vent L.P. side to atmosphere. Connect output of the instrument to the standard test gauge. Adjust zero. Apply required pressure to the high pressure side and adjust the span. Adjust zero gain if necessary. 6. How is flow measured in square root? Flow varies directly as the square root of pressure. Thus, $F \propto \sqrt{P}$ of square root of applied pressure. Since this flow varies as the square root of differential pressure. The pressure pen does not directly indicate flow. Thus flow can be determined by taking the square root of the pen. Assume the pen reads 50% of the chart. So, flow can be calculated using the pen measure in the chart. 7. Name different parts of a pressure gauge. Explain the use of hair spring in the pressure gauge. Pressure gauge includes following components: a. 'C' type bourdon tube. b. Connecting link. Sector gear. Pinion gear. Hair spring. Pointing. Dial Use of hair spring: Hair spring is responsible for controlling torque. It is also used to eliminate any play into linkages. 8. How D.P. transmitter can be applied to close tank? In closed tank, bottom of the tank is connected to the high pressure side of the transmitter. Top of tank is connected to the lower pressure side of the transmitter. In this way vessel pressure can be measured. 9. How D.P. transmitter can be applied to open tank? In open tank the lower pressure side is vented to the atmosphere. All pressure is applied to the high pressure side. This vessel pressure is measured through high pressure side. 10. Explain the working of an electronic level trol? The variation in level of buoyancy resulting from a change in liquid level varies the net weight of the displacer increasing or decreasing the load on the torque arm. This change is directly proportional to change in level and specific gravity of the liquid. The resulting torque tube movement varies the angular motion of the rotor in RVDT providing a rotor change proportional to the rotor displacement, which is converted and amplified to a D.C. current. 11. Explain the working of an enraf level gauge. Enraf level gauge is based on the servo powered null balance technique. A displacer serves as continuous level sensing element. A two phase servo motor controlled by a capacitive balance system winds unwinds the measuring wire until the tension in the weight springs is in balance with the weight of the displaced part immersed in the liquid. The sensing system in balance measures the two capacitance formed by the moving central sensing rod provided by the two capacitor plates and the si plates. 12. What is the constant voltage unit? The constant voltage circuit consists of a rectifier, CR and a filter capacitor. It is followed by two stages of zener regulation. A bridge configuration is provided to lamp line voltage zener regulation. 13. Explain the burnout feature. Burnout provides the warnsg feature of driving indicator at the end of scale, if the input circuit is open. A burnout resistor is provided which develops a voltage drop between the measuring circuit and amplifier. The polarity of the signal determines the direction of the servo drive upon an open circuit in the input. Upscale burnout: R value 10 MDownscale burnout: R value 22 M14. Why thermowells are used? What materials are used in thermowells? In numerous applications, it is neither desirable nor practical to expose a temperature sensor directly to a material. Wells are therefore used to protect against damage corrosion, arosion, abrasion and high pressure processes. A thermowell is also useful in protecting a sensor from physical damage during handling and normal operations. Materials used in thermowells: Stainless steel, Inconel, Monel, Alloy Steel, Hastelloy. 15. How is automatic reference junction compensation carried out in temperature recorders? In automatic reference junction compensation, variable nickel resistor is used. As the temperature changes, so does its resistance. This reference junction compensator is located, so that it will be at the temperature of the reference junction. The reference junction is at the post where the dissimilar wire of the thermocouple is rejoined. This joint is invariably at the terminal strip of the instrument. 16. What are de-saturators? When, in some processes, e.g. batch processes, long transient responses are expected during which a sustained deviation is present the controller integral action continuously drives the output to a minimum or maximum value. This phenomenon is called 'integral saturation of the control unit'. When this condition is met, then this unit is de-saturated. 17. Explain the working of Rotameter. Variable area meters are special form of head meters. Where in the area of flow restrictor is varied. So as to hold the differential pressure constant. The rota meter consists of a vertical tapered tube through which the metered fluid flows in upward direction. As the flow varies the 'float' rises or falls to vary the area of the passages that the differential across it balances the gravitational force on the 'float'. The differential pressure is maintained constant. The position of the 'float' is the measure of the rate of flow. 18. What is the working principle of the magnetic meter? An electric potential is developed when a conductor is moved across the magnetic field. In most electrical machinery the conductor is a wire. The principle is equally applicable to a moving, electrically conductive liquid. The primary device of commercial magnetic meters meters consist of straight cylindrical electrically insulated tube with a pair of electrodes nearly flush with the tube walls and located at opposite end of a tube diameter. This device is limited to electrically conducting liquids. The magnetic meter is particularly suited to measurement of slurries and dirty fluids. 19. Explain the mechanism behind the turbine meter. Turbine meters consist of straight flow tube within which a turbine or fan is free to rotate about its axis which is fixed along the centre line of the tube. Mostly, a magnetic pick up system senses the rotation of the rotor through the tube walls. The turbine meter is a flow rate device, since the rotor speed is directly proportional to the flow rate. The output is usually in the form of electric pulses from the magnetic pick up with a frequency proportional to the flow rate. 20. How would you choose differential range? The most common range for differential range for liquid measurement is 0-100. This range is high enough to minimize the errors caused by unequal heads in the seal chambers. It is also dependent on the differences in the temperature of the load lines. The 100 range permits an increased in capacity up to 400. While decrease down up to 20 by merely changing the range tubes or range adjustments. 21. What is the use of single seated valve? The single seated valve is used on smaller sizes where an absolute shut off is required. The use of single seated valve is limited by pressure drop across the valve in the closed or almost closed position. 22. What is the use of double seated valve? In double seated valves the upward and downward forces on the plug due to reduction of fluid pressure are nearly equalized. It is generally used on bigger size valves and high pressure systems. Actuator forces required are less. 23. What is the use of valve positioner? Valve positioner can be used for following reasons: a. Quick action. b. Valve hysteresis. c. Viscous liquids. d. Split range. e. Line pressure changes on valve. f. Bench set not standard. g. Reverse valve operations. 24. What are primary elements of measuring pressure? Which type of pressure can be measured by these elements? Primary elements of measuring pressure are: a. Bourdon Tube. b. Diaphragm. c. Capsuled. d. Bellows. e. Pressure springs. These elements are known as elastic deformation pressure elements. 25. Name different types of bourdon tubes. Types of bourdon tubes: 1. C type. 2. Spiral. 3. Helix. 26. What are different types of control valves? The commonly used control valves can be defined as follows: a. Depending on Action: Depending on action there are two types of control valves. 1. Air to close. 2. Air to open. Depending on body: Depending on body there are 4 types of control valves. 1. Globe valves. 2. Angle valves. 3. Butterfly valves. 4. Three way valves. 27. What is furnace draft control? Balanced draft boilers are generally used negative furnace pressure. When both forced draft and induced draft are used together, at some point in the system the pressure will be same as that of atmosphere. Therefore the furnace pressure must be negative to prevent hot gas leakage. Excessive vacuum in the furnace however produces heat losses through air infiltration. The most desirable condition is that the one have a very slight negative pressure of the top of furnace. 28. What is intrinsically safe system? Intrinsic safety is a technique for designing electrical equipment for safe use in locations made hazardous by the presence of flammable gas or vapours in the air. Intrinsically safe circuit is one in which any spark or thermal effect produce either normally or under specified fault conditions is incapable of causing ignition of a specified gas or vapour in air mixture at the most ignited concentration. 29. What is zener diode? What is voltage regulator? The breakdown region of a p-n diode can be made very sharp and almost vertical diodes with almost vertical breakdown region are known as zener diodes. A zener diode operating in the breakdown region is equivalent to a battery. Because of this current through zener diode can change but the voltage remains constant. It is this constant voltage that has made the zener diode an important device in voltage regulation. Voltage regulator: The output remains constant despite changes in the input voltage due to zener effect. 30. What is force balance principle? State some of its advantages. Force balance principle: A controller which generates an output signal by opposing torque. The input force is applied on the input bellows which moves the beam. This crackles nozzle back pressure. The nozzle back pressure is sensed by the balancing bellows which brings the beam to balance. The baffle movement is very less about 0.002 for full scale output. Advantages: a. Moving parts are fewer. b. Baffle movement is negligible. c. Frictional losses are less. 31. What is motion balance principle? A controller which generates an output signal by motion of its parts. The increase in the baffle is to move towards the nozzle. The nozzle back pressure will increase. This increase in the back pressure acting on the balancing bellows, will expand the bellows. The nozzle is moved upward due to this. The nozzle will move until motion almost equals the input baffle motion. 32. How will you test a transistor with a multimeter? 1. Emitter +ve of meter and base -ve output = Low resistance. 2. Emitter -ve of meter and base +ve output = High resistance. 3. Collector +ve and base -ve output = Low. 4. Collector -ve and base +ve output = Low. Emitter: Collector = High resistance. PNP: Opposite Results. 33. Explain ratio control system. A ratio control system is characterized by the fact that variations in the secondary variable don't reflect back on the primary variable. A ratio control system is the system where secondary flow is held in some proportion to a primary uncontrollable flow. If we assume that the output of a primary transmitter is A, and the output of the secondary transmitter is B, and that the multiplication factor of the ratio relay is K, then for equilibrium conditions which means set valve is equal to measured valve, we find the following relation: $KA - B = 0$ or $B/A = K$ where 'K' is the ratio setting of the relay. 34. What is solenoid valve? Where it is used? A solenoid is electrically operated valve. It consists of solenoid coil in which magnetic plunger moves. This plunger is connected to the plug and tends to open or close the valve. There are two types of solenoid valves: 1. Normally Open. 2. Normally closed. Use: It is used for safety purpose in different electric work. Articles You May Like : Basics of Level Measurement Instrumentation Technical Interview Instrument Technician Questions Fundamentals of Valves and Types PLC Raw Count Calculation

Instrumentation Question bank

which helps Instrument Engineers to prepare for Field Instrumentation Interview Questions and Answers in Oil and Gas Plant.

Field Instrumentation Questions

1. What are different types of orifice plates? State their uses. Different orifice plates are: 1. Concentric 2. Segmental 3. Eccentric

Concentric: These plates are used for ideal liquid as well as gases and steam service. Concentric holes are present in these plates, that's why it is known as concentric orifice.

Segmental: This plate has hole in the form of segment of the circle. This plate is used for colloidal and sherry flow measurement.

Eccentric: This plate has the eccentric holes. This plate is used in viscous and sherry flow measurement.

2. How do you identify an orifice in the pipeline? An orifice tab is welded on the orifice plate which extends out of the line giving an indication of the orifice plate.

3. Why is the orifice tab provided? Following reasons justify for providing orifice tab: 1. Indication of orifice plate in a line 2. The orifice diameter is marked on it. 3. The material of the orifice plate. 4. The tag number of the orifice plate. 5. To mark the inlet of an orifice. 4. Explain Bernoulli's theorem. State its application. Bernoulli's theorem states that the 'total energy of a liquid flowing from one point to another remains constant'. It is applicable for non-compressible liquids. For different types of liquid flow, Bernoulli's equation changes. There is direct proportion between speed of fluid and its dynamic pressure and its kinetic energy. It can be used in various real life situations like measuring pressure on aircraft wing and calibrating the airspeed indicator. It can also be used to low pressure in the venturi tubes present in carburetor. 5. How can a D.P. transmitter be calibrated? D.P. transmitter can be calibrated using following steps: 1. Adjust zero of Transmitter. 2. Perform static pressure test: Give equal pressure on both sides of transmitter. Zero should not shift either side. If the zero shifts then carry out static alignment. 3. Perform vacuum test: Apply equal vacuum to both the sides. Zero should not shift. 4. Calibration procedure: Give 20 psi air supply to the transmitter and vent L.P. side to atmosphere. Connect output of the instrument to the standard test gauge. Adjust zero. Apply required pressure to the high pressure side and adjust the span. Adjust zero gain if necessary. 6. How is flow measured in square root? Flow varies directly as the square root of pressure. Thus, $F \propto \sqrt{P}$ of square root of applied pressure. Since this flow varies as the square root of differential pressure. The pressure pen does not directly indicate flow. Thus flow can be determined by taking the square root of the pen. Assume the pen reads 50% of the chart. So, flow can be calculated using the pen measure in the chart. 7. Name different parts of a pressure gauge. Explain the use of hair spring in the pressure gauge. Pressure gauge includes following components: a. 'C' type bourdon tube. b. Connecting link. Sector gear. Pinion gear. Hair spring. Pointing. Dial Use of hair spring: Hair spring is responsible for controlling torque. It is also used to eliminate any play into linkages. 8. How D.P. transmitter can be applied to close tank? In closed tank, bottom of the tank is connected to the high pressure side of the transmitter. Top of tank is connected to the lower pressure side of the transmitter. In this way vessel pressure can be measured. 9. How D.P. transmitter can be applied to open tank? In open tank the lower pressure side is vented to the atmosphere. All pressure is applied to the high pressure side. This vessel pressure is measured through high pressure side. 10. Explain the working of an electronic level trol? The variation in level of buoyancy resulting from a change in liquid level varies the net weight of the displacer increasing or decreasing the load on the torque arm. This change is directly proportional to change in level and specific gravity of the liquid. The resulting torque tube movement varies the angular motion of the rotor in RVDT providing a rotor change proportional to the rotor displacement, which is converted and amplified to a D.C. current. 11. Explain the working of an enraf level gauge. Enraf level gauge is based on the servo powered null balance technique. A displacer serves as continuous level sensing element. A two phase servo motor controlled by a capacitive balance system winds unwinds the measuring wire until the tension in the weight springs is in balance with the weight of the displaced part immersed in the liquid. The sensing system in balance measures the two capacitance formed by the moving central sensing rod provided by the two capacitor plates and the si plates. 12. What is the constant voltage unit? The constant voltage circuit consists of a rectifier, CR and a filter capacitor. It is followed by two stages of zener regulation. A bridge configuration is provided to lamp line voltage zener regulation. 13. Explain the burnout feature. Burnout provides the warnsg feature of driving indicator at the end of scale, if the input circuit is open. A burnout resistor is provided which develops a voltage drop between the measuring circuit and amplifier. The polarity of the signal determines the direction of the servo drive upon an open circuit in the input. Upscale burnout: R value 10 MDownscale burnout: R value 22 M14. Why thermowells are used? What materials are used in thermowells? In numerous applications, it is neither desirable nor practical to expose a temperature sensor directly to a material. Wells are therefore used to protect against damage corrosion, arosion, abrasion and high pressure processes. A thermowell is also useful in protecting a sensor from physical damage during handling and normal operations. Materials used in thermowells: Stainless steel, Inconel, Monel, Alloy Steel, Hastelloy. 15. How is automatic reference junction compensation carried out in temperature recorders? In automatic reference junction compensation, variable nickel resistor is used. As the temperature changes, so does its resistance. This reference junction compensator is located, so that it will be at the temperature of the reference junction. The reference junction is at the post where the dissimilar wire of the thermocouple is rejoined. This joint is invariably at the terminal strip of the instrument. 16. What are de-saturators? When, in some processes, e.g. batch processes, long transient responses are expected during which a sustained deviation is present the controller integral action continuously drives the output to a minimum or maximum value. This phenomenon is called 'integral saturation of the control unit'. When this condition is met, then this unit is de-saturated. 17. Explain the working of Rotameter. Variable area meters are special form of head meters. Where in the area of flow restrictor is varied. So as to hold the differential pressure constant. The rota meter consists of a vertical tapered tube through which the metered fluid flows in upward direction. As the flow varies the 'float' rises or falls to vary the area of the passages that the differential across it balances the gravitational force on the 'float'. The differential pressure is maintained constant. The position of the 'float' is the measure of the rate of flow. 18. What is the working principle of the magnetic meter? An electric potential is developed when a conductor is moved across the magnetic field. In most electrical machinery the conductor is a wire. The principle is equally applicable to a moving, electrically conductive liquid. The primary device of commercial magnetic meters meters consist of straight cylindrical electrically insulated tube with a pair of electrodes nearly flush with the tube walls and located at opposite end of a tube diameter. This device is limited to electrically conducting liquids. The magnetic meter is particularly suited to measurement of slurries and dirty fluids. 19. Explain the mechanism behind the turbine meter. Turbine meters consist of straight flow tube within which a turbine or fan is free to rotate about its axis which is fixed along the centre line of the tube. Mostly, a magnetic pick up system senses the rotation of the rotor through the tube walls. The turbine meter is a flow rate device, since the rotor speed is directly proportional to the flow rate. The output is usually in the form of electric pulses from the magnetic pick up with a frequency proportional to the flow rate. 20. How would you choose differential range? The most common range for differential range for liquid measurement is 0-100. This range is high enough to minimize the errors caused by unequal heads in the seal chambers. It is also dependent on the differences in the temperature of the load lines. The 100 range permits an increased in capacity up to 400. While decrease down up to 20 by merely changing the range tubes or range adjustments. 21. What is the use of single seated valve? The single seated valve is used on smaller sizes where an absolute shut off is