SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF

ELECTRONICS AND INSTRUMENTATION ENGINEERING

QUESTION BANK

V SEMESTER

1907501 – INDUSTRIAL INSTRUMENTATION - II

Regulation – 2019

Academic Year 2022 – 23

Prepared by
K.S.JAIBHAVANI
Assistant Professor (Selection Grade)

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203.

DEPARTMENT OF ELECTRONICS AND NSTRUMENTATION ENGINEERING

QUESTION BANK

SUBJECT : 1907501 – INDUSTRIAL INSTRUMENTATION - II

SEM / YEAR: V / III

UNIT I - VARIABLE HEAD TYPE FLOWMETERS			
Expression for flow rate through restriction(compressible and incompressible flow) -Orifice plate – different types of orifice plates – Cd variation – pressure tappings – Venturi tube – Flow nozzle – Dall tube – Pitot tube –combined pitot tube - averaging pitot tube – installation and applications of head flow meters.			
PART – A			
Q. No	**Questions**	**BT Level**	**Competence**
1.	Explain turbulent flow.	**BTL 4**	**Analyze**
2.	Discuss about Vena contracta point.	**BTL 2**	**Understand**
3.	Which type of restriction type flow meter is preferred for semisolid flow? Why?	**BTL 5**	**Evaluate**
4.	What is laminar flow?	**BTL 1**	**Remember**
5.	List the different units of flow.	**BTL 4**	**Remember**
6.	Generalize the primary use of Reynolds number for describing fluid flow.	**BTL 6**	**Create**
7.	What is Bernoulli's theorem and where it is applicable?	**BTL 2**	**Understand**
8.	Mention any two applications of pitot tube.	**BTL 3**	**Apply**
9.	List the different types of Orifice plate.	**BTL 1**	**Remember**
10.	How do you identify an orifice in the pipe line?	**BTL 4**	**Analyze**
11.	Define discharge co efficient.	**BTL 5**	**Evaluate**
12.	Illustrate the advantages of Venturi tube over Orifice plate.	**BTL 3**	**Apply**
13.	Define Beta ratio.	**BTL 1**	**Remember**
14.	Define the term Velocity approach factor in fluid flow measurement.	**BTL 1**	**Remember**
15.	What is Pitot tube?	**BTL 1**	**Remember**
16.	What is the need for square root extractor?	**BTL 1**	**Remember**
17.	Bernoulli's equation is mathematical expression of _____	**BTL 2**	**Understand**
18.	Obtain the difference between compressible and incompressible liquid.	**BTL 4**	**Analyze**

19.	A pitot tube is used to measure the velocity of water in a pipe. The stagnation pressure head is 6m and static pressure head is 5 m. Calculate the velocity of flow assuming the discharge coefficient of tube equal to 0.98.	**BTL 2**	**Understand**
20.	Discuss the advantages and disadvantages of Pitot tube.	**BTL 2**	**Understand**
21.	Why is a Dall tube preferred over venturi tube?	**BTL 5**	**Analyze**
22.	A submarine moves horizontally in the sea and has its axis much below the surface of sea water. A pitot tube properly placed just in front of the submarine is connected to a differential pressure gauge. The pressure difference between the Pitot pressure and static pressure was found to be 20 kN/m^2.Find the speed of submarine (in m/sec and km/hr) if the density of sea water is 1026 kg/m^3.	**BTL 6**	**Create**
23.	Illustrate the factors to be considered while selecting a flow meter.	**BTL 3**	**Apply**
24.	What is the purpose of providing ample straight-pipe lengths before and after a flowmeter?	**BTL 3**	**Apply**
	PART – B		
1.	Derive the expression for flow rate through restriction for incompressible fluids. **(13)**	**BTL 6**	**Create**
2.	Explain the difference between compressible and incompressible fluids? **(13)**	**BTL 1**	**Remember**
3.	Distinguish variable head and variable area flow meters. Explain the working principle of any one type of variable head flow meter with neat sketch. **(13)**	**BTL 2**	**Understand**
4.	Describe the construction, working principle and installation procedure of an orifice meter and also derive the expression for its coefficient of discharge. **(13)**	**BTL 3**	**Apply**
5.	Describe the machining methods and tapping in orifice flow meter. **(13)**	**BTL 1**	**Remember**
6.	Describe with neat sketch any two closed channel flow meter. **(13)**	**BTL 1**	**Remember**
7.	Write Short notes on **(i)** Flow Nozzle **(8)** **(ii)** Dall tube **(7)**	**BTL 2**	**Remember**
8.	Derive an expression for compressible fluids. **(13)**	**BTL 5**	**Create**
9.	**(i)**. Explain the construction and working of venturimeter. **(7)** **(ii).**What are its advantages and disadvantages? **(6)**	**BTL 4**	**Analyze**
10.	Explain in detail about the installation of head type flow meters. **(13)**	**BTL 2**	**Understand**
11.	What are the factors to be considered in piping arrangements? **(13)**	**BTL 3**	**Apply**

12.	**(i).** What are the factors to be considered in piping arrangement for flow meter? **(7)** **(ii).** With a neat diagram, explain the construction of different types of venturi tube and discuss about its installation. **(6)**	**BTL 4**	**Analyze**
13.	**(i).** Derive the Bernoulli's equation. **(7)** **(ii).** Write Short notes on flow nozzles. **(6)**	**BTL 6**	**Create**
14.	**(i).** Water is flowing through a venturi having 40 mm throat diameter. If 1200 kg of water flows in two minutes and the discharge coefficient is 0.95, what will be the pressure head on a mercury manometer connected to the venturi? Density of water is 1000 kg/m^3 and mercury is 13600 kg/m^3. **(7)** **(ii).** Derive an expression for quantity of flow through variable head flow meter. **(6)**	**BTL 5**	**Evaluate**
15.	**(i).** Discuss the installation of head flow meter and piping arrangement for different type of fluid. **(8)** **(ii).**Determine the flow velocity of water of density 1000 kg/m^3at the head of a Pitot tube if it produces a pressure differential of 10 kPa between the outlets and if the same pressure differential is obtained in air at an altitude where the density of air is 0.650 kg/m^3, determine the velocity of air flow. **(5)**	**BTL 2**	**Understand**
16.	**(i).** Illustrate about the construction, working principle of Dall tube with neat diagram. **(7)** **(ii).**Mention advantages and disadvantages of Dall tube. **(6)**	**BTL 3**	**Apply**
17.	Briefly explain how a Pitot static tube can be used to measure average flow rate. What are the errors associated with measurement of pressure in Pitot tube? Explain. **(13)**	**BTL 1**	**Remember**
	PART – C		
1.	Compare different types of pressure tappings and recommend one method for measuring low pressure. **(15)**	**BTL 5**	**Evaluate**
2.	Summarize the installation and piping arrangements of different fluids in head flow meters. **(15)**	**BTL 5**	**Evaluate**
3.	Compile different methods in installing sealing pots. **(15)**	**BTL 6**	**Create**
4.	Discuss the installation of head flow meter & piping arrangement for different fluids. **(15)**		

5.	**(i)** A venturi tube of throat diameter 11 cm is placed in a water pipe of diameter 18 cm to measure the volumetric flow. The volumetric flow rate through the venturi tube is 0.07 m^3/sec and a water has the viscosity of 10^{-3} Pa -s. **a)** Determine the Reynolds number for the flow conditions mentioned above. **b)** Determine the upstream to throat differential pressure developed. (C_d =0.98) **c)** Comment on the C_d value of venturi meter. **(8)** **(ii)** Generalize the methods involved in erection of condensation of pots. **(7)**	**BTL 6**	**Create**

UNIT II - QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS			
Positive displacement flow meters: – Nutating disc, Reciprocating piston and Oval gear flow meters – Inferential meter – Turbine flow meter – Variable Area flow meter:– Rotameter theory, characteristics, installation and applications – Mass flow meter :– Angular momentum – Thermal, Coriolis type mass flow meters – Calibration of flow meters: – Dynamic weighing method			
PART – A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Discuss the basic principle of variable area flow meter.	**BTL 2**	**Understand**
2.	Discuss about inferential flow meter.	**BTL 2**	**Understand**
3.	Point out the principle behind the inferential flow meter.	**BTL 4**	**Analyze**
4.	Distinguish between positive displacement and inferential type flow meter.	**BTL 2**	**Understand**
5.	An elbow tap of diameter 60 mm is fitted in a water flow line. If the mercury manometer shows a differential head of 50 mm, what is the volume flow rate? The discharge coefficient can be taken as 0.89 and specific gravity of mercury as 13.6	**BTL 3**	**Apply**
6.	Analyze the classification of flow meters.	**BTL 4**	**Analyze**
7.	._____ is the empirical number that indicates the effect of changes of temperature on viscosity of fluid	**BTL 2**	**Understand**
8.	Generalize the applications of turbine flow meters.	**BTL 6**	**Create**
9.	How is *k* factor of turbine flow meter determined?	**BTL 2**	**Understand**
10.	Quote the principles of turbine flow meter.	**BTL 1**	**Remember**
11.	Name the positive displacement flow meters.	**BTL 1**	**Remember**
12.	Why does a Rota meter called as variable area meter? List any two forces acting on a Rota meter float.	**BTL 4**	**Analyze**
13.	Classify the various types of variable area flow meter.	**BTL 3**	**Apply**
14.	What is the principle on which angular momentum flow meter work?	**BTL 1**	**Remember**
15.	Write the difference between the volume flow rate and mass flow rate.	**BTL 1**	**Remember**

16.	Relate the torque and mass flow rate in angular momentum type mass flow meter.	**BTL 3**	**Apply**
17.	List the steps involved in dynamic weighing method of calibrating flow meter.	**BTL 1**	**Remember**
18.	Why does a flowmeter need calibration?	**BTL 4**	**Analyze**
19.	What is Coriolis effect?	**BTL 1**	**Remember**
20.	What are the applications of rotameter?	**BTL 3**	**Apply**
21.	Generalize the significant sources of error in Coriolis flow meter.	**BTL 6**	**Create**
22.	Deduce which device is used for residential water service measurement?	**BTL 5**	**Evaluate**
23.	The reamed holes in the walls of the cylinder equally spaced in cylinder and piston type area meter why?	**BTL 5**	**Evaluate**
24.	Recommend a device used for calibration of flow meter.	**BTL 5**	**Evaluate**
	PART – B		
1.	**(i).**Describe with neat sketch, the construction and working of inferential meter and reciprocating pumps. **(10)** **(ii).**List the advantages and disadvantages of inferential meter and reciprocating pumps. **(3)**	**BTL 1**	**Remember**
2.	Discuss in detail about the construction and working of: **(i)** Nutating disc type flow meter. **(7)** **(ii)**. Oval gear type flow meter. **(6)**	**BTL 2**	**Understand**
3.	What are mechanical flow meters and how many groups are they divided? Describe in detail about any one positive displacement meter for flow measurement. **(13)**	**BTL 1**	**Remember**
4.	**(i).**What is the principle used in turbine flow meter? With a neat sketch, Illustrate the construction and working of Turbine flow meter. **(10)** **(ii).**Show the advantages and disadvantages of Turbine flow meters. **(3)**	**BTL 3**	**Apply**
5.	**(i).** A Rotameter has an effective height of 200 mm, effective base diameter of 10 mm and top diameter of 20 mm. It has a float of diameter 10 mm, thickness 3 mm and density 2500 kg/m3. Its discharge coefficient is 0.95; if water is flowing through it and the float is at 100 mm height what is the rate of flow? **(6)** **(ii).** Discuss the electronic type Inferential meter. **(7)**	**BTL 5**	**Evaluate**
6.	**(i).**Describe with neat sketch the construction and working of rotameter. **(10)** **(ii).**Discuss the advantages and disadvantages of rotameter **(3)**	**BTL 2**	**Understand**
7.	Explain angular momentum mass flow meter in detail. **(13)**	**BTL 1**	**Remember**

8.	A rotameter uses a cylinder float of 3.5 cm height, 3.5 cm diameter and density of 3900 kg/m3. The maximum inside diameter of the metering tube is 5 cm. Determine the maximum flow rate handling capacity of the rotameter if the fluid is water. **(13)**	**BTL 6**	**Create**
9.	Explain the principle operation of Thermal mass flow meter with neat sketch. **(13)**	**BTL 4**	**Analyze**
10.	Explain in detail about the calibration of flow meters by using dynamic weighing method. **(13)**	**BTL 4**	**Analyze**
11.	**(i).** Discuss about the working principle of Coriolis mass flow meter. **(7)** **(ii).** List the features and advantages of Coriolis mass flow meter. **(6)**	**BTL 2**	**Understand**
12.	Explain the principle of operation of Calibration of Turbine flow meters. **(13)**	**BTL 2**	**Understand**
13.	Illustrate the installation procedure with neat sketch for any two flow meters. **(13)**	**BTL 3**	**Apply**
14.	Derive an expression for volumetric flow rate in rotameter.**(13)**	**BTL 3**	**Apply**
15.	Explain the impeller flow meter and the calibration of different flow meters. **(13)**	**BTL 4**	**Analyze**
16.	Evaluate the installation procedure of Rotameter in detail with relevant diagrams. **(13)**	**BTL 5**	**Evaluate**
17.	Write a detailed note on liquid flow rate meters calibration. (**13)**	**BTL 1**	**Remember**
	PART – C		
1.	Write the basic equations involved in determining the flow rate using Rotameter. **(15)**	**BTL 6**	**Create**
2.	Compose the method of variable area measurement using necessary equations and diagrams for measuring liquid flow rate. **(15)**	**BTL 6**	**Create**
3.	Deduce the equations involved in angular momentum type mass flow meter. **(15)**	**BTL 5**	**Evaluate**
4.	Convince constant torque-hysteresis clutch method is widely used angular momentum mass flow meter. **(15)**	**BTL 5**	**Evaluate**
5.	Create a Piping and Instrumentation diagram for any process which involve flow measuring instrument and controller. **(15)**	**BTL 6**	**Create**

UNIT III - ELECTRICAL TYPE FLOW METERS			
Principle and constructional details of Electromagnetic flow meter – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter – Open channel flow measurement – Solid flow rate measurement			
PART – A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Examine the advantages of using AC excitation in Electromagnetic flow meter.	**BTL 3**	**Apply**
2.	Discuss the types of excitation used in electromagnetic flow meter.	**BTL 2**	**Understand**
3.	An electromagnetic flow meter having a flow tube of 100 mm diameter generates an electric voltage of 21.3 mV for a magnetic field of 5 tesla. Find the volume quantity of the liquid flowing through the meter.	**BTL 4**	**Analyze**
4.	Generalize the applications of electromagnetic flow meter.	**BTL 6**	**Create**
5.	Examine the different types of ultrasonic flow meter.	**BTL 1**	**Remember**
6.	Generalize the limitations of ultrasonic flow meter.	**BTL 4**	**Analyze**
7.	Infer the principle used in Laser Doppler Anemometer.	**BTL 4**	**Analyze**
8.	Explain Doppler Effect.	**BTL 5**	**Evaluate**
9.	Ina Doppler shift ultrasonic flow meter, the sonic beam is directed at 45^0 to the upcoming stream of liquid. The frequency of ultrasonic is 35000Hz. It is received back at a frequency of 35200 Hz. The velocity of sound in the flowing liquid is $1250ms^{-1}$. Calculate the liquid flow velocity.	**BTL 2**	**Understand**
10.	Discuss about the frequency formula used in laser Doppler Anemometer.	**BTL 2**	**Understand**
11.	Give the principle of vortex shedding flow meter.	**BTL 2**	**Understand**
12.	Define vortex	**BTL 1**	**Remember**
13.	What is a Swirl meter?	**BTL 1**	**Remember**
14.	Define Target Flow meter.	**BTL 1**	**Remember**
15.	Mention any two method to measure flow in open channel.	**BTL 2**	**Understand**
16.	Show the commonly used methods for solid flow rate measurement.	**BTL 3**	**Apply**
17.	List the different types of solid flow meters.	**BTL 1**	**Remember**
18.	Quote the three popular weir used and explain about weir.	**BTL 1**	**Remember**
19.	What are the applications of nuclear method of solid flowrate measurement?	**BTL 3**	**Apply**
20.	Point out the different methods of solid flow measurement.	**BTL 4**	**Analyze**
21.	Evaluate the need for flow switch.	**BTL 5**	**Evaluate**
22.	Obtain the advantages of vortex shedding flow meter.	**BTL 3**	**Apply**

23.	Evaluate the important guide lines in the selection of flowmeter.	**BTL 5**	**Evaluate**
24.	A magnetic flowmeter will not properly measure the flow rate of Caustic – analyse.	**BTL 6**	**Create**
	PART – B		
1.	An electromagnetic flow meter is used to measure an average flow of liquid in a pipe of 50 mm diameter. The velocity profile is symmetrical and can be assumed uniform. The flux density in the liquid has a peak value of 0.1 wb/m^2. The output from the flow meter electrode is taken to an amplifier gain of 1000 and impedance between the electrodes is 250 K ohm. The input impedance of the amplifier is 250 K ohm. **(i)** Determine the average velocity of the liquid when the peak to peak voltage at the amplifier output is 0.2 V **(7)** **(ii)** Given that the effluent conductivity decreases by 20% with the same flow rate, determine the percentage change in reading at the amplifier output. **(6)**	**BTL 3**	**Apply**
2.	**(i).**Explain the principle working, construction of electromagnetic flow meter and target flow meter with neat sketch. Discuss about the advantage and disadvantages. **(10)** **(ii).**Explain about the types of excitation in Electromagnetic flow meters. **(3)**	**BTL 4**	**Analyze**
3.	**(i).** Explain the working of Doppler shift ultrasonic flow meter. **(13)**	**BTL 4**	**Analyze**
4.	**(i).**Describe with neat diagram the construction and working of ultrasonic flow meter. **(7)** **(ii).**Write its advantages and limitations. **(6)**	**BTL 2**	**Understand**
5.	Explain in detail about the cross correlated ultrasonic flow meter. **(13)**	**BTL 4**	**Analyze**
6.	Write short notes on **(i)** Target Flow meter **(7)** **(ii)** Vortex shedding flow meter. **(6)**	**BTL 1**	**Remember**
7.	**(i).** Write short notes on solid flow measurement. **(7)** **(ii).** List the various factors on which the selection of flow meter depend. **(6)**	**BTL 1**	**Remember**
8.	What is weir? Explain V notch weir with neat diagram. Derive an expression for estimation of total weir discharge. **(13)**	**BTL 1**	**Remember**
9.	List out the difficulties in measuring in open channel flow measurement. How it differs from closed channel flow measurement? Explain any one with neat diagram. **(13)**	**BTL 1**	**Remember**
10.	Explain about solid flow measurements with necessary diagram and also list applications of solid flow measurement. **(13)**	**BTL 5**	**Evaluate**
11.	Describe in detail about gravimetric method of measuring solid flow measurement. **(13)**	**BTL 2**	**Remember**

12.	Generalize the final control elements used in solid flow control and measurement and explain in detail with neat sketch. **(13)**	**BTL 6**	**Create**
13.	Illustrate with neat sketch about different types of sensors used in solid flow measurement. **(13)**	**BTL 3**	**Apply**
14.	Compare electrical type flow measurement with non-electrical type flow measurement and explain its merits and demerits. **(13)**	**BTL 2**	**Understand**
15.	Discuss about the sources of errors in electrical type flow meter. **(13)**	**BTL 2**	**Understand**
16.	Why Electromagnetic flow meters are not recommended for gas flow measurements? Explain in detail. **(13)**	**BTL 3**	**Apply**
17.	Evaluate the working of laser Doppler anemometer for the measurement of instantaneous velocity of liquids. **(13)**	**BTL 5**	**Evaluate**
	PART – C		
1.	Investigate about the high flow rate measurement device and explain its working in detail. **(15)**	**BTL 6**	**Create**
2.	Summarize the constructional details and working of Deflecting plate Solid Flow Meters. **(15)**	**BTL 5**	**Evaluate**
3.	Generalize the types of notches and explain the method of flow measurement using notches. **(15)**	**BTL 6**	**Create**
4.	Explain Weigh Feeder method of solid flow rate measurement and its final control element. **(15)**	**BTL 5**	**Evaluate**
5.	Create a Piping and Instrumentation diagram for any process which involve flow measuring instrument and controller of electrical type. **(15)**	**BTL 6**	**Create**
	UNIT IV - LEVEL MEASUREMENT		
Level measurement: – Float gauges - Displacer type – D/P methods -Bubbler system-Load cell – Electrical types – Conductivity sensors – Capacitive sensors – Nucleonic gauge – Ultrasonic gauge – Boiler drum level measurement :– Differential pressure method and Hydrastep method –Solid level measurement.			
	PART – A		
Q.No	**Questions**	**BT Level**	**Competence**
1.	What are the advantages of float type level measurement?	**BTL 1**	**Remember**
2.	State the limitations of float type level indications.	**BTL 1**	**Remember**
3.	Compare between float and displacer.	**BTL 2**	**Understand**
4.	Write the advantages of float type level measurement system.	**BTL 1**	**Remember**

5.	Examine the limitations of float level indication	**BTL 3**	**Apply**
6.	A bubbler system is used to measure the level of water in a container. If the level vary between 5 meters and 35 meters, what is the minimum bubbler pressure required?	**BTL 2**	**Understand**
7.	In a air bubble gage, the bubble tube is immersed in water up to 400 mm below the water surface. If the air pressure is to be measured by an U tube mercury manometer, what will be the mercury head height in mm?	**BTL 4**	**Analyze**
8.	Summarize two commonly used electrical method for measuring liquid level in industries.	**BTL 1**	**Remember**
9.	Generalize the advantages of capacitance level measurement.	**BTL 6**	**Create**
10.	Draw the setup of liquid level measurement for non-conducting liquids with equivalent circuit with a capacitive type level sensor.	**BTL 6**	**Create**
11.	Discuss about the any one type of capacitor probe.	**BTL 2**	**Understand**
12.	Where is a thermal level gauge suitable?	**BTL 1**	**Remember**
13.	Define purge level system.	**BTL 1**	**Remember**
14.	Explain the use of suppression and elevation.	**BTL 5**	**Evaluate**
15.	Mention the advantages of Air purge system.	**BTL 3**	**Apply**
16.	A pressure gauge indicate 10 PSI at the bottom of an open water tank. What is the level of water above the gauge?		
17.	Analyse which device is suitable for measuring level of corrosive and abrasive liquids.	**BTL 4**	**Analyze**
18.	What is DPT (Differential pressure transmitter)?	**BTL 2**	**Remember**
19.	Illustrate how are direct and indirect methods of level measurement done?	**BTL 3**	**Apply**
20.	Draw the tilt switch arrangement for measurement of level for liquid and solid.	**BTL 4**	**Analyze**
21.	What is a float switch?	**BTL 2**	**Remember**
22.	Which level-measurement technologies cannot be adapted to measure solid (powder) level in a vessel?	**BTL 3**	**Apply**
23.	How will you choose the correct level measurement instrument?	**BTL 4**	**Analyze**
24.	Suppose a storage vessel holds a liquid of unpredictable density. Identify which level measurement technology will not maintain accurate measurement of liquid height in the vessel as the liquid density changes.	**BTL 5**	**Evaluate**
PART – B			
1.	**(i).** Explain the principle of operation of displacer type level measuring scheme with neat sketch. **(7)** **(ii).** How does the capacitance type level meter work? **(6)**	**BTL 4**	**Analyze**

2.	Illustrate how gauge glass techniques coupled with photo electric read out system can be used for level measurement. **(13)**	**BTL 3**	**Apply**
3.	Explain level measurement using bubbler system in detail. **(13)**	**BTL 5**	**Evaluate**
4.	**(i).** Discuss the principle of operation of bubbler type level measurement. **(7)** **(ii).** Explain diaphragm box type level measurement. **(6)**	**BTL 2**	**Understand**
5.	Describe the principle of capacitance level measurement and discuss about any one type of capacitance probe. **(13)**	**BTL 1**	**Remember**
6.	**(i).**Discuss the electrical types of level measurement. **(7)** **(ii).**Explain magnetic level gauge with neat sketch. **(6)**	**BTL 2**	**Understand**
7.	Describe about the operation and application of ultrasonic level gauge with suitable sketch. **(13)**	**BTL 1**	**Remember**
8.	With a neat sketch, Illustrate how level is measured using nuclear radiations. **(13)**	**BTL 3**	**Apply**
9.	Explain boiler drum level measurement using hydra step system **(13)**	**BTL 4**	**Analyze**
10.	**(i).**With neat diagram, explain boiler drum level measurement. **(6)** **(ii).** With neat diagram, explain the resistance type of level measurement. **(7)**	**BTL 4**	**Analyze**
11.	Explain three element boiler drum level control. **(13)**	**BTL 4**	**Analyze**
12.	List the non-contact type of level measurement system. Explain with neat sketch the working construction of any two of them. **(13)**	**BTL 1**	**Remember**
13.	Describe about the level sensors selection and applications. **(13)**	**BTL 1**	**Remember**
14.	Describe briefly about the different methods of indirect liquid level measurement. **(13)**	**BTL 2**	**Understand**
15.	Draw a schematic diagram and explain the method used for radiometric level detection and measurement. **(13)**	**BTL 2**	**Understand**
16.	Explain need for ultrasonic method of level measurements with diagram and its applications**.** **(13)**	**BTL 3**	**Apply**
17.	Evaluate the procedures involved in the measurement of level in pressure vessel. **(13)**	**BTL 5**	**Evaluate**
PART – C			
1.	Nuclear level instruments provide point and continuous level measurement. Support the statement using necessary sketches. **(15)**	**BTL 5**	**Evaluate**
2.	Summarize how Gauge glasses are used to measure liquid level. **(15)**	**BTL 5**	**Evaluate**
3.	Generalize on Tape Flow Level Instruments and its associated instruments in level measurement. **(15)**	**BTL 6**	**Create**

4.	Generalize the Differential pressure method of level measurement. **(15)**	**BTL 6**	**Create**
5.	Create a Piping and Instrumentation diagram for any process which involve level measuring instruments and controllers. **(15)**	**BTL 6**	**Create**

UNIT V - TRANSMITTERS			
Pneumatic transmitter: Operation – Electronic transmitter: Study of 2 wire and 4 wire transmitters – Operation of Electronics and Smart transmitters – Principle of operation of flow, level, temperature and pressure transmitters – Installation and Calibration of smart and conventional transmitters.			
PART – A			
Q. No	**Questions**	**BT Level**	**Competency**
1.	Define transmitters.	**BTL 1**	**Remember**
2.	Examine the principle used in pneumatic transmitter.	**BTL 3**	**Apply**
3.	Illustrate the applications of temperature transmitter.	**BTL 3**	**Apply**
4.	When do you call a pressure as a pneumatic pressure?	**BTL 4**	**Analyze**
5.	Draw the block diagram of electronic transmitter.	**BTL 6**	**Create**
6.	Write a note on different stages of transmitters.	**BTL 1**	**Remember**
7.	Differentiate flow and level transmitter based on its principle of operation.	**BTL 4**	**Analyze**
8.	Compare 2 wire and 4 wire transmitter.	**BTL 2**	**Understand**
9.	Describe the temperature transmitter and the principle used in it.	**BTL 2**	**Understand**
10.	Define calibration of transmitters.	**BTL 1**	**Remember**
11.	Examine about the pressure range involved in the operation of pressure transmitter.	**BTL 3**	**Apply**
12.	Explain rangeablity in transmitters.	**BTL 5**	**Evaluate**
13.	Explain Signal Pulse Modulation.	**BTL 5**	**Evaluate**
14.	What is a smart transmitter? Why it is called so?	**BTL 1**	**Remember**
15.	How smart and conventional transmitter differ from each other?	**BTL 4**	**Analyze**
16.	Discuss about remote adjustability in transmitter.	**BTL 2**	**Understand**
17.	Draw 2 wire and 4 wire transmitter.	**BTL 6**	**Create**
18.	Write down the advantages and uses of electronic transmitter.	**BTL 1**	**Remember**
19.	What is UART? Mention its uses.	**BTL 1**	**Remember**
20.	Define installation of transmitters.	**BTL 2**	**Understand**
21.	What are the primary elements used for flow measurement?	**BTL 2**	**Remember**

22.	How to select the best ultrasonic level sensor range for optimum performance?	**BTL 3**	**Apply**
23.	How do you carry out piping for a differential pressure flow transmitter on liquids, gas and steam services?	**BTL 4**	**Analyze**
24.	How do you do a zero check on a differential pressure transmitter?	**BTL 5**	**Evaluate**
	PART – B		
1.	**(i).**Define the terms associated with industrial data transmission. **(13)**	**BTL 1**	**Remember**
2.	Explain the operation of flow transmitter with suitable sketch. **(13)**	**BTL 4**	**Analyze**
3.	**(i).** Explain how pressure is used in the process of transmission with neat sketch. **(7)** **(ii).**Explain about the pressure ranges used in process of transmission and its limitations**.** **(6)**	**BTL 5**	**Evaluate**
4.	Illustrate the features of smart and intelligent transmitter. **(13)**	**BTL 2**	**Understand**
5.	Briefly describe the functioning of smart and intelligent transmitter. **(13)**	**BTL 2**	**Understand**
6.	Explain the principle of operation of level type transmission with a neat sketch. **(13)**	**BTL 5**	**Evaluate**
7.	Explain the working of force-balance transmitters with neat diagram. **(13)**	**BTL 5**	**Evaluate**
8.	Enumerate the types of pneumatic transmitters used in the process industry. **(13)**	**BTL 5**	**Evaluate**
9.	**(i)** What is a transmitter? **(5)** **(ii)** What are the types of transmitters used in Industrial control and explain? **(8)**	**BTL 1**	**Remember**
10.	Describe with neat sketch the working of a square-root-extracting differential pressure transmitter. **(13)**	**BTL 1**	**Remember**
11.	Explain with neat sketch the working of differential pressure pneumatic transmitter. (**13)**	**BTL 4**	**Analyze**
12.	Describe the different installation methods of conventional transmitters. **(13)**	**BTL 2**	**Understand**
13.	Explain with neat sketch the construction and working of a pneumatic temperature transmitter. **(13)**	**BTL 2**	**Understand**
14.	**(i)** What is calibration? **(4)** **(ii)** Explain the different calibration methods of smart and conventional transmitters. **(9)**	**BTL 1**	**Remember**
15.	Explain the advantages and disadvantages associated with force-balance transmitters along with applications. **(13)**	**BTL 2**	**Understand**

<table>
<tr><td>16.</td><td>Explain the principle of operation of electronic transmitter . (13)</td><td>BTL 3</td><td>Apply</td></tr>
<tr><td>17.</td><td>A pneumatic differential pressure transmitter has a calibrated range of −100 to +100 inches of water column (” W.C.), and its output signal range is 3 to 15 PSI.

Complete the following table of values for this transmitter, assuming perfect calibration (no error). (13)

<table><tr><td>Input Pressure applied</td><td>Percent of span</td><td>Output signal</td></tr><tr><td></td><td></td><td></td></tr></table></td><td>BTL 5</td><td>Evaluate</td></tr>
<tr><td colspan="4">PART – C</td></tr>
<tr><td>1.</td><td>Sketch the functional block of smart and intelligent transmitter with communication facility and explain it. (15)</td><td>BTL 6</td><td>Create</td></tr>
<tr><td>2.</td><td>Explain the principle of Buoyancy (level and density) transmitters. (15)</td><td>BTL 5</td><td>Evaluate</td></tr>
<tr><td>3.</td><td>Sketch the motion balance pneumatic pressure transmitter with zero adjustment and explain it. (15)</td><td>BTL 6</td><td>Create</td></tr>
<tr><td>4.</td><td>Write short notes on variable area flow transmitters. (15)</td><td>BTL 5</td><td>Evaluate</td></tr>
<tr><td>5.</td><td>Create a Piping and Instrumentation diagram for any process which involves smart transmitters and controllers. (15)</td><td>BTL 6</td><td>Create</td></tr>
</table>