

Sl. No. of Question Paper: 6132

Unique Paper Code : 2511305
Name of the Paper : Industrial Instrumentation
Name of the Course : B.Tech. Instrumentation
Semester : IIIrd
Duration : 03 Hours
Maximum Marks : 75

F-5

Instructions for candidates

Attempt five questions in all.

Question No.1 is compulsory.

Use of scientific calculator is allowed.

B. Tech. Instrumentation/III sem
Paper ELI-DC-I-301
Industrial Instrumentation

Time: 3 Hours

Maximum Marks: 75

- Q.1 (a) Explain how sensitivity can be increased by using inclined tube manometer? (3)
- (b) Name accelerometers, which are not very reliable for continuous indication, but actuate only if the acceleration exceeds a preset high value. (3)
- (c) Calculate the flow of water through a 400x150 mm horizontal venturimeter, if the U-tube mercury manometer connected between inlet and throat of venturi shows a differential pressure of 250 mm of mercury. Assume that specific gravity of mercury is 13.6 and the co-efficient of discharge is 0.98. Water has a density of 10^3 Kg/m^3 . (3)
- (d) Describe the working of fly-ball tachometer. (3)
- (e) Explain the circular chart recorder. (3)
- Q.2 (a) Describe the construction and theory of well type manometer. What is "area correction factor"? Explain how in commercial type of well manometer, scales are so graduated that user has not to apply the area correction factor? (7)
- (b) Describe the construction and working of an Electromagnetic flow meter. (5)
- (c) What are the advantages of spiral type Bourdon tube in pressure measurement? (3)
- Q.3 (a) Show that there exists a linear relationship between volume flow rate and displacement of float in case of rotameter. Also, prove flowing fluid density independence of the flow meter. (7)
- (b) Explain a standard vacuum pressure measuring device. (5)
- (c) An electromagnetic flow meter is used to measure the average flow rate of a liquid in a pipe of diameter of 50 mm. 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 ; this output from the flow meter electrodes is taken to an amplifier of gain 1000 and impedance between the electrodes is $250 \text{ K}\Omega$. Input impedance of the meter is $2.5 \text{ M}\Omega$. (3)
- a) Determine the liquid's average velocity when the peak to peak voltage at the amplifier output is 0.2 V.
- b) Given that the liquid's conductivity is decreased by 20%, with the same flow rate; determine the percentage change in reading at the amplifier output.
- Q.4 (a) Give the functioning of a stroboscope and explain how speed of a rotating shaft can be measured using a single pattern and multi-pattern disc? (7)
- (b) Which moisture measurement method is best for heat sensitive samples? Explain with one example. (5)

- (c) An accelerometer has a seismic mass of 0.05 Kg and a spring constant of 3×10^3 N/m. Maximum mass displacement is ± 0.02 m (before the mass hits the stop). Calculate maximum measurable acceleration and natural frequency. (3)

Q.5 (a) Which parameter needs knowledge of temperature: absolute or relative humidity? And why? (4)

(b) Describe the process of refrigeration? (6)

(c) Give the advantages of X-Y recorders. Give one application of X-Y recorder. (5)

Q.6 (a) Explain how calibration of pressure gauges is carried out by dead weight tester? What are the factors affecting the accuracy of dead weight tester? (7)

(b) Describe the construction and working of ultrasonic flow meter. (5)

(c) State dew point and relative humidity. (3)

Q.7 (a) Draw and explain the working of a Venturimeter. (6)

(b) How can you use thermal conductivity flow cell with wheastone bridge to measure pressure? (5)

(c) Explain how vacuum is created using a rotary pump? (4)