Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PECH 5304

Fifth Semester Regular Examination – 2014

PROCESS INSTRUMENTATION

BRANCH : BIOTECH

QUESTION CODE : H 218

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 ×10

   (a) State the type of level switches.

   (b) What is the air purge system ?

   (c) What are the types of inferential flow meters ?

   (d) How will measure the mass flow rate ?

   (e) What are steps involved in calibrating a thermometer ?

   (f) Of what use are the absolute temperature scales ?

   (g) What will be the gauge pressure and absolute pressure at the depth of 35 m in water tank ? Express them in kg/cm^2 and mm in Hg.

   (h) What are the different units are used for pressure measurements ?

   (i) Calculate the buoyancy force on an object that displaces 5 m^3 of water at 20^0 C.

   (j) Define quantity flow meters.

2. A Displacer with area of cross-section 5 cm^2, length 8 m and specific gravity 6 is used for measuring water level in a tank of maximum level 8 meters. The displacer

P.T.O.

is weighted with spring balance directly. Also the displacer is used to measure the level from bottom of the tank.

(a) Find out the levels when the spring balance reads (i) 23, (ii) 22 and (iii) 21 kgs. 5

(b) What does the spring balance read when the tank is full ? 5

3. Consider an electromagnetic flow meter which is used to measure volumetric flow of a process fluid in a pipe of 60 mm dia. The velocity profile is symmetrical and can be assumed uniform. The flux density in the liquid is 0.1 Wb/square meter. The output from the flow meter is given to an amplifier of gain 1000 and impedance between the electrodes is 275 Kilo-ohms. The input impedance of the amplifier is 275 Kilo-ohms. Find the average velocity of the liquid when the P-P voltage at the amplifier output is 0.3 V. 10

4. (a) Describe the operation of the air bubbler level measurement system. 5

(b) Explain briefly about the selection of a flow meter. 5

5. (a) Water is pumped through a 75 mm diameter pipe with a flow velocity of 760 mm/sec. Find the volume flow rate and mass flow rate. Density of water is 1000 kg/m^3. 5

(b) What is pyrometer ? Explain the working principle of pyrometer. 5

6. (a) Convert the temperature –40 degree Celsius to others scales. What is accuracy of measurement ? For a 1% accuracy meter whose span is 1000 degree Celsius ? What is the probable error at any point of scale ? 5

(b) What are the differences between a motion balance and a force balance systems ? 5

7. (a) Describe the operation of the air bubbler level measurement system. 5

(b) Discuss the Angular-Momentum-Type mass flow meters. 5

8. Write short notes on any **two** : 5×2

(a) Mass spectroscopy

(b) Hook-type level indicator

(c) Force-balance pressure gauges

(d) Filled System thermometers.