328355(28)

B. E. (Third Semester) Examination, April–May 2020

(New Scheme)

(ET & T Branch)

INDUSTRIAL INSTRUMENTATION

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) from each question is compulsory. Attempt any two parts from (b), (c) and (d) of each question.*

Unit-I

1. (a) What is the difference between primary and secondary measurement? 　　　　　　　　2

(b) With help of block diagram explain working of digital storage oscilloscope. 7

(c) Explain measurement of phase using various Lissajous patterns. 7

(d) Describe the construction, working, advantages and disadvantages of LCD. What is the difference between field and dynamic scattering? 7

Unit-II

2. (a) Define zero drift. 2

(b) Difference between :

(i) Repeatability and Reproducibility

(ii) Live Zero and Dead Zone 7

(c) With help of neat sketch, explain measurement of capacitance by variation in liquid level of non conducting liquid which act as dielectric. 7

(d) State Piezo resistive effect. With help of neat sketch explain measurement of strain using unbounded strain gauge. 7

Unit-III

3. (a) Define absolute and relative humidity. 2

(b) With help of neat sketch, explain working of Seismic type velocity transducer. 7

(c) Explain shaft speed measurement using Strobaocope and while measuring speed of steam turbine with stroboscopic single line images were observed for Stroboscope setting of 4000, 4500 and 5200 r.p.m. Calculate the speed of turbine. 7

(d) Write short notes on Resistive Hygrometer. 7

Unit-IV

4. (a) State Stephan Boltzman law. 2

(b) A bimetallic strip is constructed of strips of nickel chrome-iron alloys and invar bonded together at 25°C. The strip is 50 mm long and each material has a thickness of 1 mm.

Calculate :

(i) Radius of curvature when strip is subjected to a temperature of 200°C.

(ii) Movement of the free end in a perpendicular direction from the initial line. Assume the following data :

For low expansion invar : $\alpha_1 = 1 \cdot 7 \times 10^{-6}$ per °C,

$E_1 = 150$ GN/m²

For high expansion ni-chrome iron alloy :

$\alpha_2 = 12 \cdot 5 \times 10^{-6}$ per °C, $E_2 = 220$ GN/m².

How the result would change when the strip is initially in the form of cantiliver with one end fixed and other end free? 7

(c) The tubes for two legs of U tube manometer have diameter of 4 mm and 20 mm. When subjected to certain differential pressure, the difference in height of mercury in the two columns is 200 mm. For the same differential pressure, how would this difference in height be affected if both the limbs are of the same diameter. 7

(d) With help of neat sketch, explain mechanism of C type Bourden Gauge. How angularity error and multi-plication error can be controlled? 7

Unit-V

5. (a) Define Reynolds number. 2

(b) Derive an expression for the flow rate of an incompre-ssible fluid through a variable head flow meter. 7

(c) Calculate the flow of water through a 400 × 150 mm horizontal venturimeter, if the U tube mercury manometer connected between inlet and throat of the venturimeter shows a differential pressure of 250 mm mercury. Assume the specific gravity of mercury is 13·6 and coefficient of discharge is 0·98. Water has a density of 10^3 kg/m³. 7

(d) With help of neat sketch, explain working of solar cell. 7