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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90431

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Aeronautical Engineering

OAN 551 – SENSORS AND TRANSDUCERS

(Common to Automobile Engineering/Electrical and Electronics Engineering/Industrial Engineering/Industrial Engineering and Management/ Materials Science and Engineering/Mechanical Engineering/Robotics and Automation Engineering/Food Technology/Information Technology/ Pharmaceutical Technology/Civil Engineering/Computer Science and Engineering/Computer and Communication Engineering/Manufacturing Engineering/Marine Engineering/Mechatronics Engineering/Production Engineering/Biotechnology)

(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. State the criteria for sensor classification.
2. A voltmeter is calibrated for 1 V to 5 V. The accuracy is specified within ± 0.5 percent of instrument span. What is the maximum static error ?
3. Mention the limitations of LVDT and RVDT.
4. What are the types of optical encoders ?
5. Define Stroboscope and Strobotron.
6. What are the basic classes of rotation sensing gyros ?
7. Enumerate the advantages of smart sensors.
8. List the thin-film deposition techniques.
9. State the main signal conditioning stages in a DAQ system.
10. Draw the functional block diagram of Dual-Slope ADC.

PART – B (5×13=65 Marks)

11. a) Discuss in detail the dynamic characteristics of a first order transducer system for the step, ramp and sinusoidal inputs with necessary response graphs. (13)

(OR)

b) Explain the dynamic characteristics of a second-order mass-spring system with their step, ramp and frequency response graphs. (13)

12. a) Discuss in detail the working principle, detection scheme and the components of a Laser Range Sensor (LIDAR) with neat sketch. (13)

(OR)

b) Explain the principle of operation of force balance accelerometer and deduce the equation for sensitivity. (13)

13. a) Deduce the gauge factor for the resistance type strain gauge and briefly explain the types of resistance strain gauges with neat sketch. (5+8)

(OR)

b) Define Hall effect. Explain the basic operation of Hall effect sensor with neat sketch. Mention its applications. (2+8+3)

14. a) Discuss in detail the principle of operation of fluid pressure sensors and their types and measuring techniques. (13)

(OR)

b) i) Explain the working principle of Thermocouple and its compensation techniques. (7)

ii) Discuss the salient features of RTD. (6)

15. a) Discuss the technicalities of sensors employed in manufacturing field. (13)

(OR)

b) Explain the salient features of sensors used in home appliances. (13)

PART – C (1×15=15 Marks)

16. a) A linear second order system with single degree of freedom has a mass of 4×10^{-3} kg and stiffness of 2000 N/m.

i) Calculate the natural frequency of the system. (5)

ii) Determine the damping constant necessary to just prevent overshoot in response to a step input of force. (5)

iii) Calculate the frequency of damped oscillations if the damping ratio is reduced to 50% of its value as calculated in (i). (5)

(OR)

b) Design a Data Acquisition System for acquiring signal from sensors/ transducers with neat block diagram. (15)