Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 51021

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fifth Semester

Aeronautical Engineering

OAN 551 — SENSORS AND TRANSDUCERS

(Common to Aerospace Engineering/ Automobile Engineering/Civil Engineering/ Computer Science and Engineering/ Computer and Communication Engineering/Electrical and Electronics Engineering/ Industrial Engineering/ Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Material Science and Engineering/Mechanical Engineering/ Mechanical Engineering (sandwich)/ Mechatronics Engineering/Production Engineering/ Robotics and Automation/ Artificial Intelligence and Data Science/Bio Technology/ Computer Science and Business Systems/Food Technology/Information Technology/Pharmaceutical Technology)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish repeatability and reproducibility of a sensor.

2. A voltmeter is calibrated for 1 mV to 5 mV. The accuracy is specified within ±0.1 percent of instrument span. What is the maximum static error?

3. Define the principle of operation of RF beacons.

4. Define the principle of operation of resolver.

5. Comment on the gauge factor of a strain gauge.

6. Define Hall Effect and its applications.

7. State the compensation technique employed to compensate the cold junction temperature variation in a thermocouple.

8. Draw the functional block diagram of a smart sensor.

9. State the role of filters in a DAQ system with an example.

10. Enumerate the applications of data logger in automobile industry.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss in detail the different steps involved in sensor calibration. (13)

Or

(b) Drive the expression for the sensitivity of a second-order system and discuss its dynamic characteristics with a suitable example. (5+8)

12. (a) Discuss in detail the working principle of optical, magnetic and inductive types of encoders with neat sketch. State the applications of encoders. (3+3+3+4)

Or

(b) Explain the salient features and applications of GPS and Bluetooth range sensors. (13)

13. (a) Write a note on the working principle of following sensors with neat sketch

(i) Gyroscope (7)

(ii) Inclinometer (6)

Or

(b) Write a note on the functions of the following sensors with neat sketch

(i) Load cell (6)

(ii) Magneto resistive sensor (7)

14. (a) Define piezoelectric effect. Discuss in detail the principle of operation of piezoelectric sensor with a suitable example. (2+11)

Or

(b) Define photoelectric effect. What are the types of photoelectric sensors? Explain the working principle of a photoconductive cell. (2+6+5)

15. (a) Discuss the measurement technique employed in environment monitoring using sensors and data acquisition system with neat sketch. (13)

Or

(b) Explain the principle of operation of any two analog to digital conversion techniques employed in DAQ systems with functional block diagrams. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Analyse the significance of different errors affecting the performance of sensors with suitable examples. (15)

Or

(b) Describe the design and fabrications steps of a MEMS sensor with suitable example. (15)

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