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

# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*(A constituent unit of MAHE, Manipal)*

**SEVENTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)**

**END SEMESTER DEGREE EXAMINATIONS, JANUARY - 2021**

**SUBJECT: Multi-sensor data fusion [ICE 4011]**

TIME: 3 HOURS 01-02-2021 MAX. MARKS: 50

**Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.***

***Include diagrams and equations wherever necessary***

1A. Distinguish between multi-sensor integration and multi-sensor data fusion.

1B. Give an example of a multi-sensor data fusion system that uses a serial network. What are its advantages and disadvantages?

1C. Define data incest and does it affect the multi-sensor data fusion systems employing centralized architecture? Justify your answer with an example.

(2+4+4)

2A. What is data association? Describe the process of data association with the help of an example.

2B. When is semantic alignment used in data fusion? Explain any clustering algorithm used for semantic alignment.

2C. Given data for five people in Table 2C. Each person vector has a Height, Score on some test, and age, determine the Mahalanobis distance of another person v = (57, 640, 48) from the population.

Table 2C

| X<br>Height | Y<br>Score | Z<br>Age |
|---|---|---|
| 77 | 557 | 34 |
| 61 | 593 | 37 |
| 74 | 588 | 40 |
| 67 | 652 | 42 |
| 71 | 605 | 57 |

(3+3+4)

3A. Compare NNSF, PDAF, and MHT association algorithms.

3B. Describe the functional relationships in data fusion and resource management with the illustration of context sharing.

3C. With relevant figures compare waterfall and omnibus frameworks.

(3+4+3)

4A. Tabulate the definition and levels in the original, and modifications in the first and second revisions of JDL data fusion.

4B. Explain TRIP model implications for resource management.

(6+4)

5A. Briefly explain the Bayesian filtering technique.

5B. Describe biological fusion, $C^2$ metaphor, and evidence combination.

5C. Describe the Kalman filtering technique and specify any two applications of it in the data fusion domain.

(3+3+4)