Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

END SEMESTER MAKE – UP EXAMINATIONS, DEC. 2019

SUBJECT: ADDITIVE MANUFATURING TECHNOLOGY [MTE 4009]

Time: 3 Hours **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.

1A.	Compare between additive manufacturing and CNC with respect to the following: i. Programming ii. Materials	**04 (2+2)**	**CO1**
1B.	Many commercial tessellation algorithms used by CAD vendors are not robust and they create a polygonal approximation of models which results in errors. Describe the case where large curvatures occur in a tessellated file.	**03**	**CO2**
1C.	Explain the need for recycling the powder material in the powder-based system.	**03**	**CO1**
2A.	Vectoflow GmbH uses additive manufacturing for manufacturing probes that measure speed and temperatures in turbo engines. In the context of the above-mentioned example: i. State the purpose of flow measurement probes in aircraft and turbomachinery design. ii. List the challenges faced by the engineers at Vectoflow. iii. Name the material that was used for manufacturing the probes. iv. Discuss the solution obtained.	**06 (2+2+1+1)**	**CO3**
2B.	State the characteristics of a powder delivery system for the powder bed fusion process.	**03**	**CO1**
2C.	Define photopolymerization.	**01**	**CO1**
3A.	Additive manufacturing applications in the automotive industry become more numerous, driving the development and adaptation of processes and technology to meet the specific needs and address the constraints of this rapidly evolving sector.	**06 (3+3)**	**CO3**

i. List the benefits of additive manufacturing in the automotive industry.

ii. BMW uses additive manufacturing in the manufacturing of jigs and fixtures.
   a. Name the additive technology used by BMW.
   b. Discuss the results obtained.

3B.	Explain the working process of Stratasys's Fused Deposited Modelling (FDM) process.	**04**	**CO1**
4A.	Interpret the STL file shown in figure Q4A. Answer the following questions: i. Name the error of the STL file. ii. State the reason for its occurrence. iii. In what way the error encountered is resolved? Represent it diagrammatically.	**04** **(1+1+2)**	**CO2**

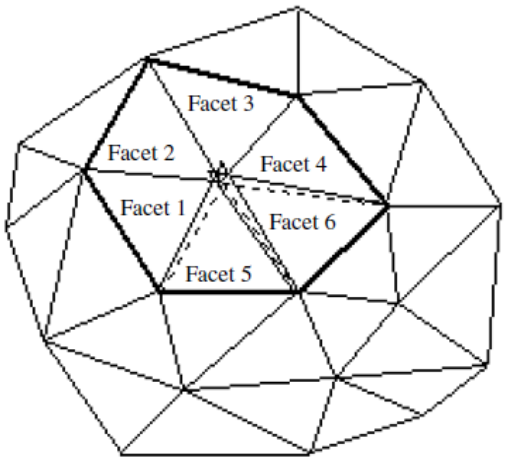

Figure Q4A

4B.	Explain the sintering process in the Selective Laser Sintering (SLS) system.	**04**	**CO1**
4C.	Define the term Rapid Tooling.	**02**	**CO3**
5A.	Draw the schematics of the Laminated Object Manufacturing (LOM) Process.	**05**	**CO1**
5B.	State some examples of reactions between powders and atmospheric gases in chemically induced sintering.	**03**	**CO1**
5C.	Draw the building environment and water extrusion subsystem of the Rapid Freeze Prototyping (RFP) system.	**02**	**CO1**