Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2018

SUBJECT: MATERIALS SCIENCE AND METALLURGY [AAE-2153]

REVISED CREDIT SYSTEM

(27/11/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. Define atomic packing factor. Sketch the unit cell of a FCC & HCP crystal structure. **(03)**

1B. Write a short note on **(03)**

i) Steel ii) Titanium

1C. Two metals A and B of melting points 1000°C and 800°C possessing complete mutual liquid solubility and negligible mutual solid solubilities, and having no chemical affinity form a eutectic at 600°C of composition 60% B. No solid-state reactions occur in the series. **(04)**

Assume solidus and liquidus lines to be straight. Draw the phase diagram for the series. Predict the number, type, composition and extent of the phases present in an alloy containing 60% A at 700°C and at room temperature of 25°C.

2A. With a neat sketch explain the filament winding. List the applications of the same. How this process is unique from the other techniques. **(05)**

2B. Explain the Jominy hardness test for hardenability with a neat sketch. Explain the variation of hardness in the same. **(05)**

3A. Neatly sketch Iron carbon equilibrium phase diagram and mark the phases. Draw the cooling curve for the same & Explain the cooling of 4.3% C alloy. **(05)**

3B. Mention the types of solid solutions. Enumerate Hume-Rothary rules governing the formation of solid solution. **(03)**

3C. Distinguish between the properties of ceramics and metals. **(02)**

4A. Explain the differences between **(04)**

i) Amorphous and crystalline solids ii) Schottky & Frankel defects

4B. Explain the following heat treatments with treatment cycle. **(04)**

i) Hardening ii) Carburizing

4C. List the effects of point defects **(02)**

5A. Explain the precipitation hardening with neat sketch? Explain how this process is different from conventional hardening & tempering processes. **(04)**

5B. With a neat sketch explain the flame hardening process **(03)**

5C. What do you mean by austenite & martensite? Explain. **(03)**