Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

III SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: MATERIAL SCIENCE AND METALLURGY [AAE 2153]

REVISED CREDIT SYSTEM
(30/11/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Briefly explain BCC, FCC and HCP structures with neat sketches. **(03)**

1B. Melting temperatures of Copper (Cu) and Silver (Ag) are 1080 degree centigrade and 960 degree centigrade respectively. The metals Copper and Silver are mutually soluble in the liquid state and partly soluble in the solid state. A liquid phase alloy containing 70% Silver completely transforms into a mixture of two solid solutions at 780 degrees centigrade. Maximum solubility of Ag in Cu and Cu in Ag are 8% and 10% respectively at 780 degrees centigrade. The room temp. solubility is negligible. Assuming the curves to be linear, draw phase diagram to scale and label the regions. For 40% Ag alloy determine the following: **(05)**
a) Weight percentage of eutectic formed.
b) Temperature where equal proportions of liquid and solid phases exists.
c)Weight ratio of Ag rich to Cu rich solid solutions present in the eutectic mixture.

1C. Explain nucleation step of solidification. **(02)**

2A. Explain the following with its composition, property and uses **(03)**
Grey Cast Iron ii) Steel

2B. Explain the purpose and steps involved in heat treatment. **(03)**

2C. Explain the precipitation hardening with neat sketch? Explain how this process is different from conventional hardening and tempering processes. **(04)**

3A. Differentiate the term hardness and hardenability. Explain the Jominy hardness test for hardenability with a neat sketch **(04)**

3B. Neatly sketch Iron-Graphite equilibrium diagram and mark all the phases. Explain the cooling of 0.8% C alloy. **(04)**

3C. Define the following **(02)**
i) Super heating ii) Super cooling

4A.	Explain the steps in the construction of a binary phase diagram which shows complete solid solubility and liquid insolubility. Name the system and sketch the diagram.	**(04)**
4B.	Define solid solutions and briefly explain the rules governing the substitutional solid solutions.	**(03)**
4C.	Explain the differences between i) Edge and Screw dislocations ii) Schottky and Frankel defects	**(03)**
5A.	With a neat sketches explain the flame hardening and Induction hardening process with its merits and demerits	**(04)**
5B.	Explain the following heat treatments with treatment cycle. a) Hardening b) Annealing.	**(03)**
5C.	Explain Recovery, Recrystallization, Grain growth	**(03)**