Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B. TECH (MECHANICAL / IP ENGG.) END SEMESTER MAKE-UP EXAMINATIONS, DECEMBER 2018

SUBJECT: MATERIAL SCIENCE AND METALLURGY [MME 2104]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Use pencil to write figures.

1A.	Differentiate between crystalline and amorphous solids.	**3**
1B.	Define packing efficiency and calculate the packing efficiency of a HCP unit cell.	**4**
1C.	Define Burger's circuit and Burger's vector and apply the same for an edge dislocation.	**3**
2A.	Define Gibb's phase rule and apply it for one component system.	**3**
2B.	What are intermediate phases? Give an example for each type.	**3**
2C.	With help of labelled neat phase diagram and cooling curves explain the eutectic II system. Give an example.	**4**
3A.	Two metals A & B are used to form an alloy containing 75% A and 25% B. A melts at 650^0C and B at 450^0C. When alloyed together, A & B do not form any compound or intermediate phases. The solid solubilities of metal A in B and B in A are negligible. The metal pair forms an eutectic at 40% A. Which solidifies at 300^0C. Assuming straight liquidus and solidus lines, draw phase diagram for the alloy series and find: a. Weight % of eutectic in the alloy at room temperature. b. The ratio of two solids in the eutectic mixture. c. Temperature when there is equal proportions of solid and liquid phases exists.	**5**
3B.	Draw a neat sketch of Fe-C phase diagram. Label all regions and explain the delta region in detail.	**5**
4A.	Superimpose various types of cooling curve on the labelled neat T-T-T diagram and describe any five of them.	**5**
4B.	Give the classification of heat treatment processes.	**3**
4C.	Define tempering process and mention the objectives.	**2**

5A.	With the help of necessary diagrams explain the microstructural changes taking place when full annealing process conducted over 0.2 % carbon steel.	**4**
5B.	List various types of surface hardening treatments and explain the carburizing process.	**3**
5C.	Tabulate the various alloying elements of steel along with their effects.	**3**