Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY BE- SEMESTER-III (NEW) EXAMINATION – WINTER 2020

Date:10/03/2021

Subject Name: Material Science and Metallurgy
Time:10:30 AM TO 12:30 PM

Total Marks:56

Instructions:

easiness.

Subject Code:3131904

- 1. Attempt any FOUR questions out of EIGHT questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

Marks

(a) An industry is fabricating stainless steel pressure vessel for nuclear 03 0.1 power plant steam generator. The butt welded joint of vessel is inspected by RT. Explain why LPT, MPT and UT cannot be performed. (b) Draw Miller indices for planes $(0\ 1\ 1)$, $(1\ 0\ 0)$, $(1\ 1\ 1)$ and $(1\ \overline{1}\ 0)$. 04 (c) Explain solid state transformation from single phase austenitic 07 temperature to room temperature for 0.2% carbon steel and draw room temperature microstructure showing relative percentage of phases present in it. 03 **Q.2** (a) Justify that grain boundary is a crystalline imperfection. (b) Explain Austenite to Pearlite transformation for eutectoid steel. 04 (c) Describe sample preparation technique for microscopic 07 examination. **Q.3** (a) Outline major mechanical property requirements of bicycle wheel 03 axle. Describe Magnetic Particle Test principle and advantages. 04 (b) List powder making process and describe atomization process with 07 (c) help of neat sketch. (a) Outline optical property requirements of window glass in very hot Q.4 03 and sunny region. Describe Ultarsonic Test principle and advantages. (b) 04 Outline the process of making powder metallurgy products in brief 07 (c) and discuss advantages of powder metallurgy. Define Heat Treatment and classify heat treatment processes. **Q.5** (a) 03 **(b)** Differentiate Galvanic corrosion and Electrochemical corrosion. 04 With proper justification choose appropriate heat treatment process 07 (c) for gear used in gearbox of car and explain the selected heat treatment process in detail. (a) Define hardenability and list three factors affecting it. 03 **Q.6** Identify role of sacrificial anode by appropriate example in corrosion 04 (b) prevention. (c) Choose and explain appropriate heat treatment process to be 07 performed on cold rolled steel plate for further manufacturing



Figure 1: Phase diagram for element A & B having partial solubility in each other