

Total No. of Questions—8]

[Total No. of Printed Pages—3

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[5559]-116

S.E. (Mechanical and Automobile Engineering) (Second Semester)

EXAMINATION, 2019

ENGINEERING METALLURGY

(2015 PATTERN)

Time : 2 Hours

Maximum Marks : 50

Please read the following instruction carefully:

1. Answer four questions: Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8
2. Neat diagram should be drawn wherever necessary
3. Use of non programmable electronic pocket calculator is allowed
4. Figures to the right indicate full marks. (Marks in square bracket are maximum marks.)

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|----|---|---|-----------|
| 1  | a | Explain with the help of neat, well labelled sketch. the term 'Dendrite'.                                   | [4]marks  |
|    | b | Differentiate between solid solution and intermetallic compound.  | [4]marks  |
|    | c | What are the variables that determine the microstructure of an alloy?                                       | [4]marks  |
| OR |   |   |           |
| 2  | a | Define the following terms<br>a) Eutectic Transformation<br>b) Grain<br>c) Solvus line.<br>d) Deoxidation:  | [4] marks |
|    | b | What is a spark test? What is its use?  | [4]marks  |
|    | c | List the steps in process used to prepare a metallographic sample for observation under optical microscope. | [4]marks  |

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| 3 | a | As the tempering temperature of a hardened component is increased, the hardness of the component decreases, Explain why the hardness of the component decreases with temperature?                        | [4]marks   |
|   | b | Draw neat diagram of microstructures and indicate phases present and their amounts in the following plain carbon steels under equilibrium conditions:<br>i. 0.4 % carbon steel<br>ii. 1.2% carbon steel: | [4]marks   |
|   | c | Rank the following iron-carbon alloys and associated microstructures from the highest to the lowest tensile strength:  | [4]marks   |
|   |   | (a) 0.25 wt% C with spheroidite<br>(b) 0.25 wt% C with coarse pearlite<br>(c) 0.60 wt% C with fine pearlite<br>(d) 0.60 wt% C with coarse pearlite<br>Justify your answer                                |            |
|   |   | OR   |            |
| 4 | a | Sketch and label microstructure of the following steels –<br>i. Hypoeutectoid steel<br>ii. Eutectoid steel   | [4]marks   |
|   | b | State two advantages of alloy steels over plain carbon steel and two advantages of plain carbon steel over alloy steel   | [4]marks   |
|   | c | What is martempering? What are the advantages of martempering over conventional hardening?   | [4]marks   |
| 5 | a | Explain why thicker sections are more susceptible to cracking during hardening heat treatment. Which heat treatment will you recommend to prevent cracking?  | [5] marks: |
|   | b | Mention the names of alloying elements used and percent of alloy used in the following steels-<br>1. T70<br>2. XT75W18Cr4V1  | [4]marks   |
|   | c | Give two major differences between martensitic and pearlitic transformations.  | [4]marks   |
|   |   | OR   |            |
| 6 | a | What influence does Molybdenum (Mo) addition have on steel? Why is Mo used as an alloying element?   | [5]marks   |
|   | b | What is stainless steel? Why are these steels stainless?   | [4]marks   |

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|   | c | Mention the names of alloying elements used and the amount in percent of alloy used in the following steels-<br>1. C40<br>2. AISI 1040                        | [4]marks |
| 7 | a | Differentiate between ferrous and non ferrous metals and alloys. Give examples of each.   | [5]marks |
|   | b | Why is it not advisable to repair by welding a structure made of non heat treatable Aluminium alloy?  | [4]marks |
|   | c | What is the difference between natural and artificial aging process of a precipitation hardening alloy?   | [4]marks |
|   |   | OR  |          |
| 8 | a | What is precipitation hardening? Explain how the hardness of Aluminium-4.5% copper alloy can be increased by precipitation hardening? Illustrate with sketch. | [5]marks |
|   | b | What is season cracking of brasses? How can it be avoided?  | [4]marks |
|   | c | Which alloy is used for soldering of electronic components? Why?  | [4]marks |