Total No. of Questions : 8]

SEAT No. :

PB3905

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[6262]-170

T.E. (Mechanical)

SURFACE ENGINEERING

(2019 Pattern) (Semester- II) (Elective-II) (302052B)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) What are the fundamental principles governing the process of diffusion in materials? **[6]**

b) Compare and contrast induction hardening, flame hardening, and laser hardening. **[6]**

c) Explain the carburizing process and how it enhances the properties of steel surfaces? **[6]**

OR

Q2) a) Contrast the processes of nitriding and carbonitriding. **[6]**

b) What information do ASTM standards G105 and G95 provide in the context of surface hardening? **[6]**

c) Provide examples fo specific industies where surface hardening treatments are commonly applied and the corresponding steel selections. **[6]**

Q3) a) With neat sketch explain Ion beam surface treatment, and how does it alter the properties of a material? **[6]**

b) What are the environmental considerations when choosing a coating for corrosion resistance? **[6]**

c) What is sol-gel coating technology, and in what industrial applications is it commonly used? **[5]**

OR

P.T.O.

Q4) a) What role do nitrides, silicides, and carbides play in compound coatings for corrosion protection? **[6]**

b) Explain the key advantages and limitations of ion beam surface treatment compared to other modification techniques? **[6]**

c) What is electroless coating, and how does it differ from electroplating in terms of application and mechanism? **[5]**

Q5) a) Explore the hot-dipping process for metal coatings and its applications. **[6]**

b) Discuss the advantages and limitations of the electrodeposition process? **[6]**

c) Highlight need of coatings for aerospace and aircrafts. List applications of it? **[6]**

OR

Q6) a) Describe the flame spraying process for metal coatings and its applications. **[6]**

b) What is cladding, and how does it differ from other metal coating processes? **[6]**

c) How do coatings contribute to the protection and longevity of different surfaces? **[6]**

Q7) a) Explain how atomic force microscopy contributes to the measurement and analysis of surface roughness. **[6]**

b) Define Over Spary, Flooding, wrinkling, Bubbling, Pin-holing, Blushing. **[6]**

c) Define crawling and cratering in the context of coating defects and discuss potential causes? **[5]**

OR

Q8) a) How is surface roughness quantified, and why is it an essential parameter in coating applications? **[6]**

b) What is Blushing, foaming? How this defect arises, mention steps to remove these defects? **[6]**

c) How does residual stress affect the stability and performance of coated materials? **[5]**